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Chennai – 47

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CHENNAI – 32

TOXICITY STUDY ON

AYAVEERA CHENDHURAM

(DISSERTATION SUBJECT)

For The Partial Fulfillment Of The

Requirements To The Degree Of

DOCTOR OF MEDICINE (SIDDHA)

BRANCH VI – NANJU NOOL AND MARUTHUVA NEETHI NOOL

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INTRODUCTION

INTRODUCTION

In most developing countries, a traditional system are grounded in long standing cultural and spiritual values and is important that policy reflect and support this rather than attempt to replace tradition with science alone. Traditional health knowledge extends to an appreciation of both the materials and non material properties of plants, minerals and animals.

Siddha medicine" means a perfect medicine. Siddha medicine claimed to revitalize and rejuvenate dysfunctional organs that cause the disease and to maintain three humours ideally. Siddhars who empowered the tremendous work in inventing siddha medicine before several decades, the knowledge was transmitted to each generation and different disciples written the evidence through palm scripts and in idol statues.

A fundamental concepts found in siddha medicine is that of balance between mind and body. Siddha philosophy investigates into the fundamental principles of the world, life and its origin. The breaking of these interconnections of life is a fundamental source of disease. Treatment therefore are designed not only to address the locus of the disease but also to restore a state of systemic balance to the individual and his or her inner and outer environment

The main effort in siddha medicine is using of metallic compounds, In the past many metallic preperations of siddha medicine and the practice were well flourished the best example is the idol statue of lord muruga architected by siddhar bogar in palani hills. The idols consist of nine different metallic preparations (*navabhasanam*) have high medicinal affinity. Since it is difficult to assay the therapeutic and toxicity of such drugs. Nowadays with the help of science, Toxicologist may overcome such difficulty, whether such preparation is neither safe nor threat. The ancient siddhars had their own methods of standardizing the drugs, by their spiritual knowledge. They detoxify the various metallic compounds in different purification methods and then processed into highly efficacious medicines

"அளவுக்கு மீறினால் அமிர்தமும் நஞ்சு" a moral note describes same as Paracelsus said "All things are poison, and nothing is without poison; only the dose permits something not to be poisonous."

Aya veera chendhuram (AVC) a metallic preparation have high privilege in curing chronic pain in various degenerative diseases. In my study to determine the safety profile of aya veeera chendhuram and for global acceptance of our Siddha metallic formulations, I choose AVC for my dissertation to ensure its safety as pre clinically.

AIM AND OBJECTIVES

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AIM

The aim of this study is to evaluate the toxicological profile of Aya Veera Chendhuram.

OBJECTIVES

Based on the literature evidences, various sources of Ayam and Veeram have been collected and purified. At each stages of purification, compound analyses have to be done. After that, the purified Ayam and Veeram will be taken and used in the preparation of Aya Veera Chendhuram as per literature. Then, the finished product of Aya Veera Chendhuram is sent for elemental analysis to estimate the presence of any heavy metals and other organic and inorganic compounds. To analysis its safety, Aya Veera Chendhuram is subjected for acute and 28 days repeated oral toxicity evaluation under OECD guideline on rodents.

Aya Veera chendhuram has been evaluated in the following aspects:

1. Collection of relevant literatures regarding Ayam and Veeram.
2. Analysis the compounds present in before and after purification of Ayam and Veeram.
3. Preparation of Aya Veera chendhuram as per textual method.
4. Physiochemical analysis of Aya Veera chendhuram.
5. Safety study of Aya Veera chendhuram on rodents.

REVIEW
of
LITERATURE

SIDDHA ASPECT

GUNAPADAM ASPECTS

அயம்

வேறுப் பெயர்கள்

அகி

அயசு

அயில்

இடி

இரும்பு

ஈச செயம்

கருங்கொல்

கருப்பி

கரும்பு

கருமணல்

கரும்பொன்

கயசு

கிருஷ்ணவையம்

காலில் நெகிளம்

ஆதி

சத்து

சிரோசரம்

சிட்டம்

திரும்பி

துண்டம்

பிண்டம்

பொன்மணல்

லோகம்

வாழ்பூமிநாதம்

கருந்தாது

இது எல்லா மலைகளிலும், நிலங்களிலும் அநேகமாகக் கந்தகம் போன்ற சில பொருள்களுடன் கலப்புற்றுக் கிடைக்கின்றது. இது, தாவர ஜீவப் பொருள்களில் சிறிதளவு கலந்தும் இருக்கின்றது.

அண்டவோடு, அப்பிரகம், கந்தி, கிளிஞ்சலோடு, கௌரி, சவ்வீரம், சாரம், சிங்கி, சிலாசத்து, சிலை, தரா, நிமிளை, பூநீறு, வங்கம், வெங்காரம், வெண்கலம், வெள்ளைப்பாடாணம், ஆகிய இவைகள் அயத்திற்குப் பகைச் சரக்குகள் என்றும், இராஜவர்த்தம், காந்தம், கெந்தி செம்பு, சூடன், செம்பு, தங்கம், நாகம், பூநாகம், பூரம், மயூரச்செம்பு, வெள்ளி ஆகிய இவைகள் நட்புச் சரக்குகள் என்றும் கூறப்பட்டிருக்கின்றன.

இதற்கு பெரும்பான்மை துவர்ப்பும், சிறுபான்மை புளிப்புக் கைப்புச்சுவைகளும், வெப்பவீரியமும் பசியுண்டாக்கி, உடல் உரமாக்கி, உடல் தேற்றி ஆகிய செய்கைளும் உள.

அயம் குருதியின் தன்மையை மேம்படுத்தும். அய சம்பந்தப்பட்ட மருந்துகள் மலக்கட்டை உண்டுபண்ணுவதால் அதை தவிர்க்க முப்பலைகூட்டிக் கொடுப்பதுவழக்கம். உடலின் எல்லா உறுப்புகளின் தொழில்களையும் தூண்டுவிக்கும். இதனால்இது உடல் தேற்றியாக தொழில் புரிகிறது.

பொதுக்குணம்

"பாண்டு வெண் குட்டம் பருந்தூல நோய்சோபை
மாண்டிடச்செய் மந்தங்கா மாலைகுன்மம் பூண்ட
பெருந்தாது நட்டமும்போம் பேதிபசி யுண்டாங்
கருந்தாது நட்டமிடுங்கால்"

இரும்பினால் பித்த பாண்டு, வெண்குட்டம், அதிதூல் நோய், சோபை, மந்தம், காமாலை, குன்மம், சுக்கிலநட்டம், கழிச்சல், இவை நீங்கும், பசி உண்டாகும்.

மற்றும் 'இளைத்தவர் இரும்பை உண்ண வேண்டும்' என்ற விதியினை "எய்ப்புடற் கிரும்பையுண்மின்" என்னும்பழமொழியால் அறிக.

சுத்தி

ஒரு பலம் அயப்பொடிக்கு ஆறு பலம் இலுப்பைப் பூச்சாறு விட்டு காலை முதல் மாலை வரை வெயிலில் வைக்க வேண்டும். இவ்விதம் ஆறு நாள் செய்து இரண்டு நாள் சாறு விடாமல் உலர்த்தி, பின்னும் இதைப்போல் இருமுறை செய்து, 25 ஆம் நாள் முதல் பத்து நாட்கள் இடைவிடாமல் மேற்படி சாறுவிட்டு, வெயிலில் வைத்துப் பின்பு, சாறுவிடாமல் இரண்டு நாள் உலர்த்தி நீர்விட்டு கழுவி எடுக்கச் சுத்தியாம்.

வேறு

ஒரு பலம் அயத்தை ஒரு பாண்டத்திலிட்டு, அத்துடன் அல்லிவேர் எட்டுபலமும்புன்னை வேர் எட்டுபலமும் இடித்துப்போட்டு பதினாறு பலம் காடி விட்டு இரவும்பகலும் தீபாக்கினியாய் எரிக்க வேண்டும். அப்படி எரிக்கும் போது காடி குறைந்து விட்டால் மறுபடியும் அதே அளவு காடி வார்த்து எரிக்க வேண்டும்.

வேறு

அயத்தை கொல்லன் உலையிலிட்டுச் சிவக்க காய்ச்சி ஆறு மாத அன்னக்காடி, எண்ணெய், ஆவின் நீர், கொள் குடிநீர், இந்நான்கிலும் கழுவிக் கொள்ள சுத்தியாம்

வேறு

இரும்பின் அரப்பொடியை எலுமிச்சம்பழச்சாறு, காடி, நாட்டு காட்டாமணக்குப் பால் இவை ஒவ்வொன்றிலும் மூன்று நாள் ஊற வைத்துக் கழுவி எடுக்க சுத்தியாம்

வேறு

அயப்பொடிக்கு நாவற்பழச் சாற்றைமூழ்கும் படி விட்டு சாறு சுண்டும் வரை வெயிலில் வைத்து கழுவுக. இவ்விதம் ஆறு முறை செய்ய சுத்தியாம்.

அயம் சேர்ந்த மருந்து

1.அயகாந்த செந்தூரம்

அளவு: குன்றி

அனுபானம்: தேன்

தீரும் நோய்: பல நோய் தீரும்

- ஆதாரம்: அகத்தியர் வைத்திய காவியம் 1500

2.உலோக செந்தூரம்

அளவு: 3 பணவெடை

அனுபானம் :தேன், பால்

தீரும் நோய்:சலக்கழிச்சல்

- ஆதாரம்: அகத்தியர் வைத்திய காவியம் 1500

3.சடாட்சர குமாரி செந்தூரம்

அளவு:பணவெடை

அனுபானம்:தேன்

தீரும் நோய்:வாதம், வாயு,சூலை,பித்தம்,மூர்ச்சை

-ஆதாரம்: அகத்தியர் வைத்திய காவியம் 1500

4.உலோக பற்பம்

அளவு:2 பணவெடை

அனுபானம்:தேன்

தீரும் நோய்: சன்னி, பிரமேகம், வாயு, எரிகுன்மம்

- ஆதாரம்:அகத்தியர் வைத்திய காவியம் 1500

5.சம்பிரதாயச் சூரணபற்பம்

அளவு:வேண்டிய அளவு

அனுபானம்:நீர்,தேன்

தீரும் நோய்:குன்மம்,கிராணி,அக்கினி மந்தம்

- ஆதாரம்:அகத்தியர் வைத்திய காவியம் 1500

6.அய செந்தூரம்

அளவு:1-2 குன்றி

அனுபானம்:தேன்

தீரும் நோய்:வாத நோய், பித்தபாண்டு, வீக்கம், உணவேற்காமை

- ஆதாரம்:அகத்தியர் பள்ளு 200

7.குருப்பட்டுக் கருப்பு

அளவு:வெந்தியம் அளவு

அனுபானம்:தேன்

தீரும் நோய்:சகல ரோகம்

- ஆதாரம்:யாகோபு

8.தாமிரக்குரு செந்தூரம்

அளவு:சீரகத்தளவு

அனுபானம்:தேன்

தீரும் நோய்:சகலவியாதி

- ஆதாரம்:யாகோபு

9.அயபற்பம்

அளவு:தேவையான அளவு

அனுபானம்:தேன்

தீரும் நோய்:கபம்,வாதம்,சூலை,மூலம்,பிரமேகம்,காமாலை,பாண்டு,குன்மம்

- ஆதாரம்:கோஷாயி

10.அய அப்பிரகச் செந்தூரம்

அளவு:1-2 குன்றி

அனுபானம்:ஆவாரம்பட்டை தூள்

தீரும் நோய்:சயம், இருமல், இரைப்பிருமல்,பிரமேகம்.

- ஆதாரம்:அனுபோக வைத்திய நவநீதம்

11.அயவீரச் செந்தூரம்

அளவு:2-4 அரிசி

அனுபானம்:தேன்,பனைவெல்லம், இஞ்சிச்சாறு

தீரும்நோய்:குன்மநோய், வாயுநோய், சன்னி

- ஆதாரம்: அனுபோக வைத்திய நவநீதம்

வீரம்

வீரமானது

மீனாட்சி மைந்தன்,

பூவிந்து சேவகன்,

சரக்குச் சுண்ணம்,

பறங்கிப் பாடாணம்,

சாரத்தின் சத்துரு,

பறிமித்துரு,

கொச்சி வீரம் என்ற பல்வேறு பெயர்களால் வழங்கப்படும்.

குணபாடம் தாது சீவ வகுப்பு

அன்றியும்,

“ஏறிய வீரமெவரைக் கூடினோன்
ஆறிய விற்பன்னாதி வெள்ளை செந்தூரந்
சூதறிய சேவகன் சேர் பிடராகனாம்
கூறிய வீரங் கொள்கிய நாமமே"

சட்டமுனி நிகண்டு 1200

விற்பன் ஆதி வெள்ளை செந்தூரம் சேவகன் பிடராகன் எனவும் வழங்கப்படுகிறது.

"வீரத்தின் பேர்தனையே விளம்பக்கேளு
விளங்கியதோர் திறவு திறனுமாகும்
மாரமாதி வெள்ளை செந்தூரமாகும்
மாகான வாதிகளுக் கெற்பமாகும்
வாரமாம் வகாரத்தின் தலைவனாகும்
மன்னியதோர் பூவிந்து வுத்தம் சேவகனாம்
தூரமா மலைகளிலே உற்பவித்த
சுயம்பான வீரத்தின் பேருமாமே "

- போகர் நிகண்டு 1200

பாடாண வகைகள் அறுபத்து நான்கில் வீரமும் ஒன்று. இயற்கையில் கிடைக்கக் கூடிய வகை ஒன்று, வைப்பு பாடாண வகை ஒன்று . இதில் இயற்கையில் கிடைக்கக் கூடிய பாடாணம் தற்போது கிடைப்பதில்லை. வைப்புபாடாணமே வீரம் என பயன்படுத்தப்படுகிறது. இப்பொருள் கொடிய விடமாகும், அளவில் சிறிது அதிகப்படினும் நஞ்சாகக் கொல்லும்.

- குணபாடம் தாது சீவ வகுப்பு

இது வெள்ளை நிறமானதாயும், எவ்வித வாசனையும் இல்லாததாயும், ஒரு வித காரமுள்ளதாயும் ,சிறு பளிங்கு கற்களைப் போலாவது, பெரிய படிகக்கல்லைப் போலாவது இருக்கும். நெருப்பிலிட்டால் இலகுவில் உருகும். நீரிலும், சாராயத்திலும், ஈதரிலும் தாராளமாய் கரையும் .இரசம் தொடர்பான பொருட்களில் நீரில் கரையும் தன்மை உடையது ஆகவே இது செயநீர் திராவகங்களில் முக்கியமாக சேர்க்கப்படுகிறது. இக்கட்டியின் மீது சிறிது சுண்ணாம்பைத் தடவினால் சிவந்து காணப்படும். வீரப்பொடியை சுண்ணாம்பு நீருடன் கலந்தால் மஞ்சள் நிற வண்டல் அடியில் படிந்த பின் சிவக்கும். இது ஒரு வைப்புச் சரக்கு.

- இரசவாத சிந்தாமணி 2ம் பாகம்

சவ்வீரம்

இதுவே வீரம் என்று சொல்லப்படும் ஒர் வைப்புச் சரக்கு. கடைகளில் கிடைப்பது படிக நிறம் போல அல்லது சிறிது மங்கலாகவும் இருக்கும். இது உடம்பின் பிணிகளை அகற்றும். மூத்திரம், வியர்வையைப் பெருக்கும் குணம் உடையது.

இது கிரந்தி, மேகம், சரும நோய், காக்கைவலி, வாத நோய், தொண்டை நோய் இவைகட்கு உள்ளுக்கு கொடுக்கவும், கண் நோய், புண் இவைகளில் வெளிப் பிரயோகமாகவும் பயன்படும். இதற்கு வாய் பிடிக்கும் அல்லது வேகச் செய்யும் குணமுள்ளதால் முறைப்படி உள்ளுக்கு கொடுக்க வேண்டும். இது வாத முறைக்கு பயன்படும்.

- சாம்பசிவம் பிள்ளை தமிழ் அகராதி

வீரம்

சுவை	- கார்ப்பு,உப்பு.
வீரியம்	**-** வெப்பம்
பிரிவு	**-** கார்ப்பு.
பஞ்சபூத அம்சம்	- அப்பு.

செய்கை

உடல் தேற்றி
கிருமி நாசினி
அழுகலகற்றி
புண்ணுண்டாக்கி

"கூட்டிய வீரமும் சுடர் செப்புத் தொட்டியும்,
பாட்டினில் னெல்லும் பதிவான தேய்விதே " .
வீரமானது "விந்துச் சரக்கு" எனக் கூறப்படுகிறது.

பண்பு

"குன்மமொடு குட்டங் கொடிய வனிலத் திரட்டு,
துன் மாங்கிசப் பெருக்கஞ் சூலை நோய்- வன்மையுறு,
காமியப் புண்ணாதிய நோய் கண்டாற்சவ்
வீரனெனுஞ் சாமி நாமத்தை யுச்சரி"

- பதார்த்த குணசிந்தாமணி

பொருள்

சவ்வீரத்தின் நாமத்தை உச்சரித்தாலே குன்மம், குறை நோய், தீங்கை விளைவிக்கின்ற மகா வாத ரோகங்களின் கூட்டம், துர்மாமிச வளர்ச்சி, சூலை நோய்கள், வன்மைப் பொருந்திய பெண் போகத்தினால் விளைகின்ற கொருக்கு, அரையாப்பு முதலிய புண்கள் நீங்கும்.

இது பலமான பூதரசகாரி இதை உட்கொண்டால் உடலிலுள்ள தாதுக்கள் அழுகிப் போகாமல் இருக்க செய்கிற மருந்து. இதை மருந்துகளோடு சேர்த்தால் சரக்குகள் மடிந்து மக்கித் தம் குணங்கள் கெட்டுப் போகாமல் காக்கும் குணமுள்ள மருந்து.

- இரசவாத சிந்தாமணி

"சுரமண்ட வாயு சன்னி தொடர்வள குமரகண்டன்,
வருனிங் கண்டமாலை வாதம் விப்புருதி கோழை,
உரை பெரு நோய் கரப்பனும் குத்துப் புறவீச்சிழை,
சருவிய கிரந்தி குட்டஞ் சவ்வீரந் தொலைக்குமாமே "

பொருள்

சுரம், அண்டவாயு, சன்னி, குமரகண்டவலி, சயம், கண்டமாலை, வாதம், விப்புருதி, கோழை,பெரு நோய்,கரப்பான், கிரந்தி, குட்டம் முதலியவை சவ்வீரத்தால் தீரும்.

-அமிர்த சாகரம்

சுத்தி முறைகள்

1." **நயம்படவே வீரமது சுத்திகேளு,**
நல்ல இளநீரில் கற்பூரம் போட்டு
சுயம்பான சட்டியிலே கலக்கி கொண்டு
தொலாயந்திரமாய் வீரத்தைக் கட்டியேதான்
மயமாக அடுப்பேத்தி யெரித்துக் கொண்டால்
வலுவான வீரமுந்தான் சுத்தியாச்சே "

-யாகோபு வைத்தியம் 300.

2. கற்பூரத்தை துளைத்து, அத்துளையில் வீரத்தை வைத்து கற்பூரத்தால் மூடி கொளுத்திய பின்னெடுத்து ஒரு ஓட்டில் கந்தகத்தை பொடித்துப் போட்டு அடியில் தீயிட்டு, உருகி நிற்கும் போது வீரத்தை மெதுவாக புரட்டி எடுக்க சுத்தியாகும்.

-பதினெண் சித்தர் ராஜவைத்திய போதினி.

3. ஒரு பங்கு வீரத்திற்கு 3 பங்கு அதிகமாக மிளகை கஞ்சி சலம் விட்டு மெழுகு பதமாக அரைத்து வீரத்திற்கு அங்கி பூட்டி சீலையில் முடிந்து இளநீரில் அழுந்தாமல் துலா எந்திரமாக கட்டி அரை சாமம் எரிக்க சுத்தியாகும்.

-சிகிச்சா ரத்ன தீபம்

4. பாகற்காயைப் பிளந்து நடுவில் வீரக்கட்டியை வைத்துக் கயிற்றால் கட்டி துலாயந்திரமாக நீரில் முழுகாவண்ணம் இளநீரில் அல்லது பழச்சாற்றில் ஒரு மணி நேரம் எரித்து எடுக்க வேண்டும். அப்பொழுது சுத்தியாகும்.

-குணபாடம் தாது சீவ வகுப்பு

5. வீரத்தை ஒரு பீங்கானிலிட்டு மூழ்கும் வரை தாய்ப்பால் விட்டு பால் முழுவதும் சுண்டும் வரை வெய்யிலில் உலர்த்தி எடுத்துக்கொள்ள சுத்தியாகும்

- சரக்கு சுத்தி செய்முறைகள்

6. படிகாரம் சூடன் வகைக்கு ஒரு பலம் எடுத்து இரண்டையும் பொடித்து வைத்துக் கொண்டு வீரக்கட்டிக்கு கொஞ்சம் கொஞ்சமாய் கிராசம் கொடுத்து எடுக்க சுத்தியாகும்.கிராசம் கொடுக்கும்போது வீரம் புகையாவண்ணம் பார்த்துக் கொள்ள வேண்டும்

- குணபாடம் தாது சீவ வகுப்பு.

7. இளநீரில் சிறிது சூடனைக் கலந்து ஒரு பானையிலிட்டு வீரத்தை துலாயந்திரமாக நீரில் படாமல் அரை மணி நேரம் எரித்து எடுத்தல்.

-குணபாடம் தாது சீவ வகுப்பு.

8.எருக்கம்பாலில் வீரத்தை மூன்று நாட்கள் ஊற வைக்க சுத்தியாகும்.

-சரக்கு சுத்தி செய்முறைகள்

9. சவ்வீரஞ் சுண்ணாம்போடு சாற்றுமா மணக்க நெய்யில்
வெவ்வமில் சுத்தியாகும்

- அமிர்த சாகரம்

10. ஒரு பலம் வீரத்திற்கு மிளகுக் குடிநீர் விட்டு 6 மணி நேரம் சுருக்கு கொடுத்துப் பிறகு மிளகுக் கல்கத்திற்குள் வைத்து, ஒரு பாண்டத்தில் அரைப்படி கறியுப்புடன் ஒரு பலம் சூடனைக் கலந்து அதற்குள் மேற்படி வீரத்தைப் புதைத்துச் சில மணி நேரம் சிறு தீயால் எரித்து எடுப்பது.

-குணபாடம் தாது சீவ வகுப்பு

11.வீரக்கட்டியை தாய்ப்பால் அல்லது பசும்பால் விட்டு வெய்யிலில் காய வைத்து எடுத்துக் கொள்ள சுத்தியாகும்.

-சரக்கு சுத்தி செய்முறைகள்

12.வீரம் ஒரு பலம், சீனாக்காரம் மூன்று பலம், இரும்பு சட்டியில் சீனாக்காரத்தை உருக்கி தண்ணீரானவுடன் வீரக்கட்டியை இட்டு கத்தியால் புரட்டிக் கொண்டு வரவும்.கட்டியானது கீழே அழுந்தி விடாமல் தடவைக்கு தடவை கொஞ்சம் தூக்கி கொடுத்து வர வேண்டும். இப்படி செய்து சீனமெல்லாம் வறண்ட பின்னெடுத்து வைத்து ஆறின பின் கட்டியின் மீதுள்ள சீனத்தை கத்தியினால் மெதுவாக சுரண்டி ஒன்றரை பலம் சூடனை தூள் செய்து கட்டியின் கீழ் மேலிட்டழுத்தி கொளுத்தி விட்டாறின பின்னெடுத்திக் கொள்வதே சுத்தியாகும்.

- அனுபோக வைத்திய நவநீதம் பாகம்- 4

13. ஒரு பலம் வீரத்தை ஒரு இளநீரில், ஒன்றேகால் வராகனெடை கற்பூரம் போட்டு கலக்கி சட்டியில் ஊற்றி அடுப்பிலேற்றி மேற்படி வீரத்தை துலாயந்திரமாக கட்டி எரித்து எடுத்துக் கொள்ள வேண்டும்.

-கோக்ஷாயி அனுபோக வைத்திய பிரம்ம ரகசியம் பாகம்-1.

வீரம் சேரும் மருந்துகள்.

1. வீரக்கருப்பு

அளவு : 1/4 முதல் 1/2 குன்றி

அனுபானம் : நெய், வெண்ணெய், தேன்

தீரும்நோய்கள் : குன்மம், குறைநோய்.

2. லோகமாரணச் செந்தூரம்

அளவு : 1 முதல் 2 குன்றி

அனுபானம் : தேன், நெய், வெண்ணெய்

தீரும்நோய்கள் : வாதப் பாண்டு, சோகை, குன்மம்.

3.இலிங்க வீரச் செந்தூரம்

அளவு :1/2 முதல் 1 குன்றி

அனுபானம் :பனைவெல்லம், நெய், இஞ்சி இளகம்

தீரும்நோய்கள் :சன்னி, சூலை, சூதகவலி, சூதகசன்னி.

4.வீரச்செந்தூரம்

அளவு :1/4 முதல் 1/2 குன்றி

அனுபானம் :இஞ்சி சாறு, தேன், பனைவெல்லம்,.

தீரும் நோய்கள் :பக்கவாதம், விடாக்கழிச்சல்

5.வீரமெழுகு

அளவு :1 முதல் 2 அரிசி எடை

அனுபானம் : பனைவெல்லம்

தீரும்நோய்கள் :குன்மம், சூலை, பக்கவாதம்.

6.வீர பற்பம்

அளவு : 1/2 முதல் 1 குன்றி

அனுபானம் : தேன், பனைவெல்லம்

தீரும்நோய்கள் :சன்னி, வலிப்பு, குன்மம்.

7.வீரப்பதங்கம்

அளவு : 1/2 முதல் 1 அரிசி

அனுபானம் : பனைவெல்லம், வெண்ணெய்

தீரும்நோய்கள் : குன்மம், குட்டம், சூலை, பக்கவாதம்

8.வீரமாத்திரை

அளவு : 1/2 முதல் 1

அனுபானம் : பனைவெல்லம், நாட்டுச்சர்க்கரை

தீரும்நோய்கள் : 13 வகை சன்னி, வாதம்.

9.வீர ரசச் செந்தூரம்

அளவு :1 முதல் 1 1/2 குன்றி

அனுபானம் :தேன்,வில்வாதி இளகம்,பறங்கிப்பட்டை இளகம்.

தீரும்நோய்கள் :மேகரணங்கள், சூலை, அழிப்புண்,
குழிப்புண், கிரந்தி.

10.சுவர்ண இரசச்செந்தூரம்

அளவு : 1 முதல் 1 1/2 குன்றி

அனுபானம் : வெல்லம், தேன்

தீரும்நோய்கள் : மேகவாயு,சூலை, குட்டம்

11. பஞ்ச பூத செந்தூரம்

அளவு : 1/2 முதல் 1 குன்றி

அனுபானம் : பனைவெல்லம்

தீரும்நோய்கள் : குன்மம், பெருவயிறு, சூலை, சன்னி

12. பஞ்சமுக செந்தூரம்

அளவு : 1 முதல் 2 அரிசி எடை

அனுபானம் : பனைவெல்லம்

தீரும்நோய்கள் : எண்வகை குன்மம், மேகசூலை, மேகவாயு.

13.மகாவீரியச் செந்தூரம்

அளவு : 1 முதல் 2 அரிசி எடை

அனுபானம் : தேன்

தீரும்நோய்கள் : எந்த வகையிலும் ஆறாத ரணங்கள்

14. பஞ்சப்பூதப் பதங்கம்

அளவு : 1 முதல் 2 அரிசி எடை

அனுபானம் : பனைவெல்லம், வெண்ணெய்

தீரும்நோய்கள் :அண்ட வாயு, மேகவாயு, குன்மம்

15.கோரோசனை மெழுகு

அளவு : 1/2 முதல் 1 குன்றி

அனுபானம் : பனைவெல்லம், வெண்ணெய்

தீரும்நோய்கள் : பக்கவாதம், நரித்தலை வாதம்

16.சண்முக மெழுகு

அளவு : 1 முதல் 1 1/2 குன்றி

அனுபானம் : பனைவெல்லம், சர்க்கரை

தீரும்நோய்கள் : சூலை, அங்குலி வாதம்

17.இரசமெழுகு

அளவு :1/2 முதல் 1 குன்றி

அனுபானம் : பனைவெல்லம்

தீரும்நோய்கள் :சூலை, பாரிசவாயு

18.பஞ்சசூத மாத்திரை

அளவு :1 முதல் 2

அனுபானம் : பனைவெல்லம், நெய், தேன்

தீரும்நோய்கள் : முகவாதம், பக்கவாதம், குன்மம்

19.மேகசஞ்சீவி மாத்திரை

அளவு : 1/2 முதல் 1

அனுபானம் : சர்க்கரை, வெண்ணெய்

தீரும்நோய்கள் : பிரமேகம், சீழ்மேகம், தந்திமேகம்

20.குருசஞ்சீவி மெழுகு

அளவு :1/2 முதல் 1 குன்றி

அனுபானம் : தேன்

தீரும்நோய்கள் : கண்டமாலை, பவுத்திரம், சிலைப்புண்

21. நவலோக மெழுகு

அளவு : 1/4 முதல் 1/2 குன்றி

அனுபானம் : பனைவெல்லம்

தீரும்நோய்கள் :மேகநோய், கிரந்திப்புண்கள், சூலை

22.இலகுவானமா மெழுகு

அளவு : 1/2 முதல் 1 குன்றி

அனுபானம் : பனைவெல்லம், சர்க்கரை

தீரும்நோய்கள் :எண்வகை காசம், எண்குட்டம்,கிரந்தி, நீரிழிவு.

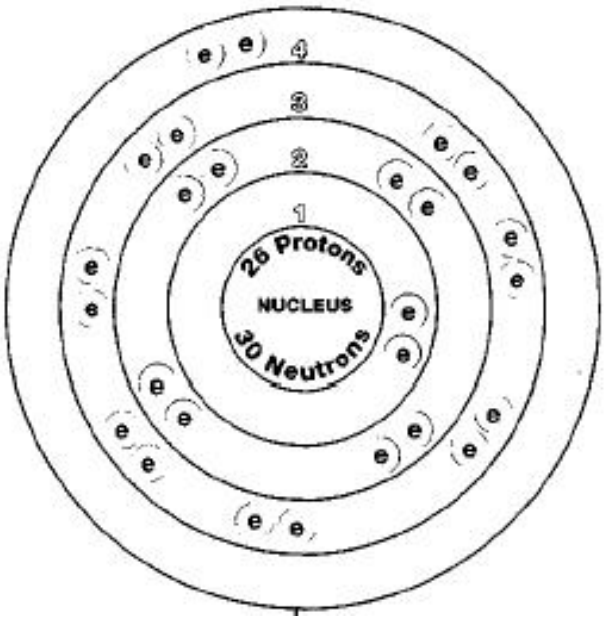
MORDERN ASPECT

IRON

Overview

The period in human history beginning in about 1200 B.C. is called the Iron Age. It was at about this time that humans first learned how to use iron metal

Iron is a transition metal. The transition metals are the elements that make up Groups 3 through 12 in the periodic table. The transition metals are typical metals in that they tend to be bright, shiny, silvery solids. They all tend to conduct heat and electricity well. And they usually have high melting points.



SYMBOL Fe

ATOMICNUMBER : 26

ATOMICMASS: 55.847

FAMILY : Group8(VIIIB) Transition metal

PRONUNCIATION

EYE-um

Iron normally does not occur as a free element in the earth. In fact, iron was not of much value to humans until they learned how to free iron from its compounds. Once they could do that, humans were able to make tools, weapons, household implements, and other objects out of iron. This step marked the beginning of the Iron Age.

Iron is most valuable not as a pure metal, but in alloys. An alloy is made by melting and mixing two or more metals. The mixture has properties different from those of the individual metals. The best known and most widely used alloy of iron is steel. Steel contains iron and at least one other element. Today, specialized steels of all kinds are available for many different applications.

Discovery and naming

- Ancient Egyptians had learned how to use iron before the First Dynasty, which began in about 3400 B.C. The Egyptians probably found the iron in meteorites. Meteorites are chunks of rock and metal that fall from the sky. Some meteorites are very rich in iron. The Egyptians made tools and jewelry out of iron.
- Iron is probably the most widely used and most important metal today.
- Iron was also known to early Asian civilizations. In Delhi, India, for example, a pillar made out of iron built in A.D. 415 still stands. It weighs 6.5 metric tons and remains in good condition after nearly 1,600 years.
- Early Chinese civilizations also knew about iron. Workers learned to produce iron as early as 200 B.C. A number of iron objects, including cannons, remain from the Han period (202 B.C. to A.D. 221).
- The Bible also includes many mentions of iron. For example, a long passage in the book of Job describes the mining of iron. Other passages tell about the processing of iron ore to obtain iron metal.
- By the time of the Roman civilization, iron had become an essential metal. The historian Pliny (A.D. 23-79) described the role of iron in Rome:

- It is by the aid of iron that we construct houses, cleave rocks, and perform so many other useful offices of life. But it is with iron also that wars, murders, and robberies are effected, and this, not only hand to hand, but from a distance even, by the aid of weapons and winged weapons, now launched from engines, now hurled by the human arm, and now furnished with feathery wings.
- Even from the earliest days, humans probably seldom used iron in a pure form. It was difficult to make iron that was free of impurities, such as **carbon** (charcoal) and other metals. More important, however, it became obvious that iron *with* impurities was a stronger metal that iron *without* impurities.
- It was not until 1786, however, that scientists learned what it was in steel that made it a more useful metal than iron. Three researchers, Gaspard Monge (1746-1818), C. A. Vandermonde, and Claude Louis Berthollet (1748-1822) solved the puzzle. They found that a small amount of carbon mixed with iron produced a strong alloy. That alloy was steel. Today, the vast amount of iron used in so many applications is used in the form of steel, not pure iron.
- Ancient Egyptians had learned how to use iron before the First Dynasty, which began in about 3400 B.C.
- The chemical symbol for iron is Fe. That symbol comes from the Latin name for iron, *ferrum.*

Physical properties

Iron is a silvery-white or grayish metal. It is ductile and malleable. It is one of only three naturally occurring magnetic elements.Iron has a very high tensile strength.

The melting point of pure iron is 1,536°C (2,797°F) and its boiling point is about 3,000°C (5,400°F). Its density is 7.87 grams per cubic centimeter. The melting point, boiling point, and other physical properties of steel alloys may be quite different from those of pure iron.

Chemical properties

Iron is a very active metal. It readily combines with **oxygen** in moist air. The product of this reaction, iron oxide (Fe_2O_3), is known as rust. Iron also reacts with very hot water and steam to produce hydrogen gas. It also dissolves in most acids and reacts with many other elements.

Occurrence in nature

Iron is the fourth most abundant element in the Earth's crust. Its abundance is estimated to be about 5 percent. Most scientists believe that the Earth's core consists largely of iron. Iron is also found in the Sun, asteroids, and stars outside the solar system.

The most common ores of iron are hematite, or ferric oxide (Fe_2O_3); limonite, or ferric oxide (Fe_2O_3); magnetite, or iron oxide (Fe_3O_4); and siderite, or iron carbonate (Fe_2CO_3). An increasingly important source of iron is taconite. Taconite is a mixture of hematite and silica (sand). It contains about 25 percent iron.

The largest iron resources in the world are in China, Russia, Brazil, Canada, Australia, and India. The largest producers of iron from ore in the world are China, Japan, the United States, Russia, Germany, and Brazil.

Isotopes

There are four naturally occurring isotopes of iron, iron-54, iron-56, iron-57, and iron-58. Isotopes are two or more forms of an element. Isotopes differ from each other according to their mass number. The number written to the right of the element's name is the mass number. The mass number represents the number of protons plus neutrons in the nucleus of an atom of the element. The number of protons determines the element, but the number of neutrons in the atom of any one element can vary. Each variation is an isotope.

Six radioactive isotopes of iron are known also. A radioactive isotope is one that breaks apart and gives off some form of radiation. Radioactive isotopes are

produced when very small particles are fired at atoms. These particles stick in the atoms and make them radioactive.

Two radioactive isotopes of iron are used in medical and scientific research. They are iron-55 and iron-59. These isotopes are used primarily as tracers in studies on blood. A tracer is a radioactive isotope whose presence in a system can easily be detected. The isotope is injected into the system. Inside the system, the isotope gives off radiation. That radiation can be followed by detectors placed around the system. Iron-55 and iron-59 are used to study the way in which red blood cells develop in the body. These studies can be used to tell if a person's blood is healthy.

Extraction

Iron goes through a number of stages between ore and final steel product. In the first stage, iron ore is heated with limestone and coke (pure carbon) in a blast furnace. A blast furnace is a very large oven in which the temperature may reach 1,500°C (2,700°F). In the blast furnace, coke removes oxygen from iron ores.

limestone removes impurities in the iron ore.

Iron produced by this method is about 91 to 92 percent pure. The main impurity left is carbon from the coke used in the furnace. This form of iron is known as pig iron. Pig iron is generally too brittle (it breaks too easily) to be used in most products.

Most scientists believe that the Earth's core consists largely of iron.

A number of methods have been developed for purifying pig iron. A common method used today is called the basic oxygen process. In this process, pig iron is melted in a large oven. Then pure oxygen gas is blown through the molten pig iron. The oxygen burns off much of the carbon in the pig iron:

A small amount of carbon remains in the iron. The iron produced in this reaction is known as steel.

The term "steel" actually refers to a wide variety of products. The various forms of steel all contain iron and carbon. They also contain one or more other elements, such as **silicon, titanium, vanadium, chromium, manganese,** cobalt, nickel, **zirconium, molybdenum,** and **tungsten.** Two other steel-like products are cast iron and wrought iron. Cast iron is an alloy of iron, carbon, and silicon. Wrought iron contains iron and any one or more of many other elements. In general, however, wrought iron tends to contain very little carbon.

Uses

It would be impossible to list all uses of iron and steel products. In general, those products can be classified into categories: (1) automotive; (2) construction; (3) containers, packaging, and shipping; (4) machinery and industrial equipment; (5) rail transportation; (6) oil and gas industries; (7) electrical equipment; and (8) appliances and utensils. (For more information on specific kinds of steel alloys, see individual elements, such as titanium, vanadium, chromium, manganese, molybdenum, and tungsten.)

Compounds

Some iron is made into compounds. The amount is very small compared to the amount used in steel and other iron alloys. Probably the fastest growing use of iron compounds is in water treatment systems. The terms ferric and ferrous refer to two different forms in which iron occurs in compounds. Some of the important iron compounds are:

The U.S. Recommended Daily Allowance (USRDA) for iron is 18 milligrams.

ferric acetate ($Fe(C_2H_3O_2)_3$): used in the dyeing of cloth

ferric ammonium oxalate($Fe(NH_4)_3(C_2O_4)_4$): blueprints

ferric arsenate ($FeAsO_4$): insecticide

ferric chloride ($FeCl_3$): water purification and sewage treatment systems; dyeing of cloth; coloring agent in paints; additive for animal feed; etching material for engraving, photography, and printed circuits

ferric chromate ($Fe_2(CrO_4)_3$): yellow pigment (coloring) for paints and ceramics

ferric hydroxide ($Fe(OH)_3$): brown pigment for coloring rubber; water purification systems

ferric phosphate ($FePO_4$): fertilizer; additive for animal and human foods

ferrous acetate ($Fe(C_2H_3O_2)_2$): dyeing of fabrics and leather; wood preservative

ferrous gluconate ($Fe(C_6H_{11}O_7)_2$): dietary supplement in "iron pills"

ferrous oxalate (FeC_2O_4): yellow pigment for paints, plastics, glass, and ceramics; photographic developer

ferrous sulfate ($FeSO_4$): water purification and sewage treatment systems; catalyst in production of ammonia; fertilizer; herbicide; additive for animal feed; wood preservative; additive to flour to increase iron levels

Health effects

Iron is of critical importance to plants, humans, and animals. It occurs in hemoglobin, a molecule that carries oxygen in the blood. Hemoglobin picks up oxygen in the lungs, and carries it to the cells. In the cells, oxygen is used to produce energy the body needs to survive, grow, and stay healthy.

The U.S. Recommended Daily Allowance (USRDA) for iron is 18 milligrams. The USRDA is the amount of an element that a person needs to stay healthy. Iron is available in a number of foods, including meat, eggs, and raisins.

An iron deficiency (lack of iron) can cause serious health problems in humans. For instance, hemoglobin molecules may not form in sufficient numbers. Or they may lose the ability to carry oxygen. If this occurs, a person develops a condition known as anemia. Anemia results in fatigue. Severe anemia can result in a lowered resistance to disease and an increase in heart and respiratory (breathing) problems. Some forms of anemia can even cause death.

Mercury(II) chloride

Mercury(II) chloride or **mercuric chloride** (archaically, **corrosive sublimate**)is the chemical compound of mercury and chlorine with the formula$HgCl_2$. This white crystalline solid is a laboratory reagent and a molecular compound. Once used as a treatment for syphilis, it is no longer used for medicinal purposes because of mercury toxicity and the availability of superior treatments.

Production

Mercuric chloride is not a salt but a linear triatomic molecule, hence its tendency to sublime. In the crystal, each mercury atom is bonded to two close chloride ligands with Hg—Cl distance of 2.38 Å; four more chlorides are more distant at 3.38 Å.

Mercuric chloride is obtained by the action of chlorine on mercury or mercury(I) chloride, by the addition of hydrochloric acid to a hot, concentrated solution of mercury(I) compounds such as the nitrate:

$$HgNO_3 + 2\ HCl \rightarrow HgCl_2 + H_2O + NO_2,$$

Heating a mixture of solid mercury(II) sulfate and sodium chloride also affords volatile $HgCl_2$, which sublimes and condenses in the form of small rhombic crystals.

Its solubility increases from 6% at 20 °C (68 °F) to 36% in 100 °C (212 °F). In the presence of chloride ions, it dissolves to give the tetrahedral coordination complex $[HgCl_4]^{2-}$

Application

The main application of mercuric chloride is as a catalyst for the conversion of acetylene to vinyl chloride, the precursor to polyvinylchloride:

$$C_2H_2 + HCl \rightarrow CH_2{=}CHCl$$

For this application, the mercuric chloride is supported on carbon in concentrations of about 5 weight percent. This technology has been eclipsed by the thermal cracking of 1,2-dichloroethane. Other significant applications of mercuric chloride include its use as a depolarizer in batteries and as a reagent in organic

synthesis and analytical chemistry . It is being used in plant tissue culture for surface sterilisation of explants such as leaf or stem nodes.

As a chemical reagent

Mercuric chloride is occasionally used to form an amalgam with metals, such as aluminium. Upon treatment with an aqueous solution of mercuric chloride, aluminium strips quickly become covered by a thin layer of the amalgam. Normally, aluminium is protected by a thin layer of oxide making it inert. Once amalgamated, aluminium can undergo a variety of reactions. For example, it will dissolve in water (this can be dangerous, as hydrogen gas and heat are generated). Halocarbons react with amalgamated aluminium in the Barbier reaction. These alkyl aluminium compounds are nucleophilic and can be used in a similar fashion to the Grignard reagent. Amalgamated aluminium is also used as a reducing agent in organic synthesis. Zinc is also commonly amalgamated using mercuric chloride.

Mercuric chloride is used to remove dithiane groups attached to a carbonyl in an umpolung reaction. This reaction exploits the high affinity of Hg^{2+} for anionic sulfur ligands.

Historic use in photography

Mercury(II) chloride was used as a photographic intensifier to produce positive pictures in the colloid on process of the 1800s. When applied to a negative, the mercury(II) chloride whitens and thickens the image, thereby increasing the opacity of the shadows and creating the illusion of a positive image.

Historic use in preservation

For the preservation of anthropological and biological specimens during the late 19th and early 20th centuries, objects were dipped in or were painted with a "mercuric solution". Objects in drawers were protected by scattering crystalline mercuric chloride over them. It finds minor use in tanning, and wood was preserved by kyanizing (soaking in mercuric chloride) Mercuric chloride was one of the three chemicals used for railroad tie wood treatment between 1830 and 1856 in Europe and the United States. Limited railroad ties were treated in the United States until there were concerns over lumber shortages in the 1890s. The process was generally abandoned because mercuric chloride was water soluble and not effective for the long

term, as well as poisonous. Furthermore, alternative treatment processes, such as copper sulfate, zinc chloride, and ultimately creosote; were found to be less toxic. Limited kyanizing was used for some railroad ties in the 1890s and early 1900s.

Historic use in medicine

Mercuric chloride was used to disinfect wounds by Arab physicians in the Middle Ages. Syphilis was frequently treated with mercuric chloride before the advent of antibiotics. It was inhaled, ingested, injected, and applied topically. Poisoning was so common that its symptoms were confused with those of syphilis. This usage of "salts of white mercury" is referred to in the Englishfolk-song, "The Unfortunate Rake".

Physical Properties

Melting point	:	277° C(lit)
Boiling point	:	302 °C
Density	:	5.44
Vapor pressure	:	1.3mm Hg(236° C)
Refractive index	:	1.859
Fp	:	302° C
Storage temp.	:	store at RT
Solubility	:	H2O : soluble
Form	:	powder
Water solubility	:	7.4g/100ml (20° C)
Merk	:	14,5876
colour	:	white crystals

Air & water reactions; slightly soluble in water.

Reactivity profile :

Mercury chloride is decomposed by sunlight. Incompatible with formats sulfites, hypophosphites, phosphates, sulfides, albumin, gelatin, alkalis, alkaloid salts, lime water, antimony, arsenic, bromides, borax, carbonates, reduced iron, copper, lead and silver salts, infusions of cinchona, oak bark or senna, tannic acids and vegetable astringents.

Health hazard :

Mercury chloride is classified as extremely toxic. All forms of mercury are poisonous if absorbed. Probable oral lethal dose is 5-50 mg/kg; between 7 drops and 1 tea spoonful for a 150 lb. person. Mercury chloride is one of the most toxic salts of mercury. Material attacks the gastrointestinal tract and renal systems.

Fire hazard :

Material may explode on heating, with friction, or contact with alkali metals, sulfides, acetylene, ammonia, and oxalic acid. Upon decomposition highly toxic chloride and mercury fumes are emitted. Avoid formats, sulfites, hypophosphites, phosphates, sulfide, albumin, gelatins, alkalis, alkaloid salts, ammonia, lime water antimony, arsenic, bromides, borax, carbonates, reduced iron, copper, iron, lead, lead, silver salts, infusions of cinchona, columbo, oak bark or senna, and tannic acid. Mercury chloride may explode with friction or application of heat. Mixtures of mercury chloride and sodium or potassium are shock sensitive and will explode on impact. Avoid contact with acids or acid fumes

Related compounds:

Other anions

Mercury (II) Fluoride

Mercury(II) Bromide
Mercury(II) Iodide

Other cations

Zinc chloride
Cadmium chloride
Mercury(I)chloride

Handling and storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

Stability :

Mercury is stable under ordinary conditions of use and storage. Slowly decomposes to metallic mercury in the presents of organic matter and sunlight, and becomes volatile at 300° C (572° F)

Hazardous Decomposition Products:

Oxides of the contained metal and halogens, possibly also free or ionic halogen.

Incompabilities :

Reacts violently with potassium and sodium. Incompatible with many compounds : formats, sulphides, phosphates, albumin, ammonia, gelatin, carbonates, hypophosphites, sulfides, alkalis, alkaloid salts, lime water, antimony and arsenic, bromids, borax, reduced iron copper, iron, lead, tannic acid and vegetable astringents.

Conditions to Avoid :

Heat, shock, friction, incompatibles.

Ecological Information

Environmental Fate :

For mercury : This material has an experimentally determined bio concentration factor (BCF) of greater than 100. This material is expected to significantly bio accumulate.

Environmental Toxicity :

24 Hr LC50 rainbow trout (juvenile) : 0.903 mg/L;

48 Hr LC50 fathed minnow : 0.037 mg/L;

96Hr LC50 bluegill sunfish (size 0.6 g) : 0.16 mg/L (static)

Dangerous to the environment. Very toxic to aquatic organisms; may cause long term adverse effects in the aquatic environment.

Mercury II chloride Therapeutic Application :

- In the treatment of syphilis, the bichloride is advised hypodermically, in doses of one-twelfth to one-sixth of a grain.
- It is also used as an intestinal antiseptic in typhoid and other conditions of this character, as has been previously stated.
- The bichloride of mercury in doses of from one-sixtieth to one-thirtieth of a grain every two hours has been used successfully in malignant sore throat and diphtheria. It is considered a potent germicide in those cases in which it can be safely used.
- The addition of a small quantity of a sodium chloride solution to the mercuric chloride solution will prevent such a decomposition. It is most commonly used upon the skin, to render it aseptic in preparation for surgical operation.
- It may be used as a gargle for the throat and mouth, and to wash putrid abscess cavities, as well as the vagina and bladder.
- Bichloride of mercury is most commonly used as a Antiseptic.
- The antiseptic properties of the bichloride of mercury are generally acknowledged and this agent as a germ destroyer is in constant use in surgery.
- Inhalations of the vapor of mercury are administered in the treatment of membranous croup and diphtheria, and if any internal use of the agent be considered rational, this method certainly could be so considered.
- If the inflammation abates and the temperature falls after its use in typhoid fever and in diphtheria, it is because of the destruction of the bacillus in each case. This statement, however, is open to question in its application to all inflammatory conditions.

Oyster shell (calcium carbonate)

Calcium carbonate is a chemical compound with the formula CaCO3. It is a common substance found in rocks in all parts of the world, and is the main component of shells of marine organisms, snails, coal balls, pearls, and eggshells. Calcium carbonate is the active ingredient in agricultural lime, and is usually the principal cause of hard water. It is commonly used medicinally as a calcium supplement or as an antacid, but excessive consumption can be hazardous.

Chemistry

Calcium carbonate shares the typical properties of other carbonates. Notably:

It reacts with strong acids, releasing carbon dioxide:

$$CaCO_{3(s)} + 2\ HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l}$$

It releases carbon dioxide on heating, called a thermal decomposition reaction, (to above 840 °C in the case of $CaCO_3$), to form calcium oxide, commonly called quicklime, with reaction enthalpy 178 kJ / mole:

$$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$$

Calcium carbonate will react with water that is saturated with carbon dioxide to form the soluble calcium bicarbonate.

$$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$$

This reaction is important in the erosion of carbonate rocks, forming caverns, and leads to hard water in many regions. An unusual form for calcium carbonate is ikait with crystal water, $CaCO_3$ - 6 H_2O. Ikait is only stable below 6°C.

Oyster shell calcium carbonate

The material derived from oyster shells is considered to be derived from organic source. Oyster shell calcium carbonate is in its purest form with 99.7% assay as CaCo3.

Specifications:

Analysis report of sanskar: oyster shell : Calcium Carbonate

Colour : creamish

Bulk density : 0.6 to 0.8gms

Description : Fine, White To Off White Micro Crystalline Powder

Solubility : Practically Insoluble In Water And In Ethanol (95%), Slightly Soluble In Water Containing Carbon Dioxide Or Any Ammonium salt. It is soluble with Effervescence in dilute acids.

Substances insoluble in Acid : 0.5 %

Arsenic : nil

Heavy metals : Traces

Barium : passes test

Iron : 0.03

Magnesium and alkali : 1%

Chloride : 0.02%

Sulphate : 0.017%

Loss on drying (1gm aat 200°C) : 2%w/w

Tapped density: 0.8gms/cc

Particle size : 100% passes thoroughly sieve of 200 (linear inch)

Assay : 99.2% as CaCo3 (on dried basis)

Health and dietary applications

Calcium carbonate is widely used medicinally as an inexpensive dietary calcium supplement or gastric antacid. It may be used as a phosphate binder for the treatment of hyperphosphatemia (primarily in patients with chronic renal failure). It is also used in the pharmaceutical industry as an inert filler for tablets and other pharmaceuticals.

Calcium carbonate is known among IBS sufferers to help reduce diarrhea. Some individuals report being symptom-free since starting supplementation. The process in which calcium carbonate reduces diarrhea is by binding water in the bowel, which creates a stool that is firmer and better formed. Calcium carbonate supplements are often combined with magnesium in various proportions. This should be taken into account as magnesium is known to cause diarrhea.

Calcium carbonate is used in the production of toothpaste and has seen resurgence as a food preservative and color retainer, when used in or with products such as organic apples or food.

Excess calcium from supplements, fortified food and high-calcium diets, can cause the milk-alkali syndrome, which has serious toxicity and can be fatal. In 1915, Bertram Sippy introduced the "Sippy regimen" of hourly ingestion of milk and cream, and the gradual addition of eggs and cooked cereal, for 10 days, combined with alkaline powders, which provided symptomatic relief for peptic ulcer disease. Over the next several decades, the Sippy regimen resulted in renal failure, alkalosis, and hypercalcemia, mostly in men with peptic ulcer disease. These adverse effects were reversed when the regimen stopped, but it was fatal in some patients with protracted vomiting. Milk alkali syndrome declined in men after effective treatments for peptic ulcer disease arose. During the past 15 years, it has been reported in women taking calcium supplements above the recommended range of 1.2 to 1.5 g daily, for prevention and treatment of osteoporosis, and is exacerbated by dehydration. Calcium has been added to over-the-counter products, which contributes to inadvertent excessive intake. Excessive calcium intake can lead to hypercalcemia, complications of which include vomiting, abdominal pain and altered mental status.

As a food additive it is designated E170; INS number 170. Used as an acidity regulator, anticaking agent, stabiliser or colour it is approved for usage in the

EU, USA and Australia and New Zealand. It is used in some soy milk and almond milk products as a source of dietary calcium; one study suggests that calcium carbonate might be as bioavailable as the calcium in cow's milk. Calcium carbonate is also used as a firming agent in many canned or bottled vegetable products.

TOXICOLOGICAL ASPECTS

IRON POISONING

Iron poisoning is an iron overload caused by a large excess of iron intake and usually refers to an acute overload rather than a gradual one. The term has been primarily associated with young children who consumed large quantities of iron supplement pills, which resemble sweets and are widely used, including by pregnant women—see over nutrition (approximately 3 grams is lethal for a 2 year old). Targeted packaging restrictions in the US for supplement containers with over 250 mg elemental iron have existed since 1978, and recommendations for unit packaging have reduced the several iron poisoning fatalities per year to almost nil since 1998. No known cases of iron poisoning have been identified that are associated with iron mining.

Nature of iron

In nature, iron is usually found in its oxidized form, iron (III) oxide, which is insoluble. Ferrous iron is soluble and its toxicity varies, largely with the integrity of the gastrointestinal lining.

Iron supplements are typically used to treat anemia. Modalities include: diet, parasite control, vitamin A, riboflavin (B_2), vitamin C (for absorption), folate, vitamin B_{12} and multivitamin-multi mineral supplements, with or without iron; potentially avoiding the use of iron only supplements.

Toxic dosage

The amount of iron ingested may give a clue to potential toxicity. The therapeutic dose for iron deficiency anemia is 3–6 mg/kg/day. Toxic effects begin to occur at doses above 10–20 mg/kg of elemental iron. Ingestions of more than 50 mg/kg of elemental iron are associated with severe toxicity.

A 325-mg tablet of ferrous sulfate has 65 mg (20%) of elemental iron

A 325-mg tablet of ferrous gluconate has 39 mg (12%) of elemental iron

A 325-mg tablet of ferrous fumarate has 107.25 mg (33%) of elemental iron

In terms of blood values, iron levels above 350-500 µg/dL are considered toxic, and levels over 1000 µg/dL indicate severe iron poisoning.

Symptoms

The first indication of iron poisoning by ingestion is a pain in the stomach, as the stomach lining becomes ulcerated. This is accompanied by nausea and vomiting. The pain then abates for 24 hours as the iron passes deeper into the body resulting in metabolic acidosis, which in turn damages internal organs, particularly the brain and the liver. The body goes into shock and death from liver failure

If intake of iron is during a prolonged period of time, symptoms are likely similar to other causes of iron overload.

Treatment

Later stage treatment consists of cleaning the iron from the blood, using a chelating agent such as deferoxamine. If this fails then dialysis is the next step.

VEERAM(MERCURY II CHLORIDE) POISONOUS EFFECTS:

வீர நஞ்சுக் குறிகுணம்

இரத்ததில் விரைவில் கலந்து விடத்தை விரைவில் விளைவிக்கும். இதனால், களிம்புச் சுவையும் , வாய் நீருறல், வாந்தி,பேதி,இரத்த பேதி,எச்சில் விழுங்கவொட்டாமற்படி தொண்டை நோதல்,முகம் வீங்கல்,தோல் வெடித்துச் சிலை நீர்வடிதல் ,வாய், தொண்டை, ஆமாசயம், வீங்கிப்புண்ணாதல் பக்கவலி, தாகம், விக்கல், மயக்கம், மூர்ச்சை,வலி,முதலியனவும் உண்டாம்.அன்றியும் மரணமுடாம்.

முறிவு:

முறையாகச் சவ்வீர மொய்குழலாய் கொண்டால்
சிறுநெருஞ்சிற் சாறுண்ணத் தீரும்-அறையகேள்
நீலவே ராகுமே நெய்ச்சட்டிச் சாறாமே
பாலி தென்னங் கள்ளும் பகர்

சிறு நெருஞ்சிற்சாறு,நீலிவேர்ப்பட்டைக் கல்கம், நெய்ச்சட்டிக் கீரைச்சாறு, தென்னங்கள் இவைகளிலொன்றை நஞ்சின்வன்மைக்கு தக்க அளவில் நஞ்சு முரியுமட்டும் கொடுக்க வேண்டும்.

கோழிமுட்டை வெண்கருவைத் தண்ணீர் அல்லது பாலுடன் கலந்து அடிக்கடி கொடுத்து வந்தாலும் , இளநீர்,அருந்தினாலும் நீங்கும்.

அண்டத்தின் வெண்கருவை யாவின்பா லிற்கலந்
துண்டுவர வீர னுரமகலுங்-கண்டரிவாய்
ஏணற்கொடியே யிளநீ ரருந்திடினு
மாணப்பெருமை வழுத்து.

என்ற கருவூரார் தண்டகச் செய்யுளால் உணரலாம்.

Inhalation:

Causes irritation to the respiratory tract. Symptoms include sore throat,Coughing, pain, tightness in chest, breathing difficulties, shortness of breath and headache. Pneumonitis may develop. Can be absorbed through inhalation with symptoms to parallel ingestion. Vapor inhalation can burn the mucous membrane of the nose and throat.

Ingestion:

Highly toxic average lethal dose for inorganic mercury salts is about one gram. May cause burning of mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diahrroea. May be followed by a rapid and weak pulse , shallow breathing, paleness, exhaustion, central nervous problems, tremours and collapse. Delayed death may occur.

Skin Contact:

Causes irritaton and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

Eye Contact:

Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision, may cause serious and permanent eye damage.

Aggravation of Pre-existing Conditions:

Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

Toxicological Data :

Oral rat LD 50:1 mg/kg.

Investigated as a tumorigen, mutgen, reproductive effector.

Reproductive Toxicity :

All forms of mercury can cross the placenta to the fetus, but most of what is known has been learned from experimental animals. See chronic Health Hazards.

Carcinogenicity :

EPA / IRIS classification : Group C – Possible human carcinogen.

MATERIALS AND METHODS

MATERIALS AND METHODS:

TEST DRUG : AYAVEERA CHENDHURAM [AVC]

Ingredients:

Purified *ayam* (ferrum)	–	1 *palam*(35 gm),
Purified *Veeram*(Hydrargyrum per chloride)	_	1*palam*
Sunnambu theli neer(limestone water)	_	sufficient quantity

Purification:

Ayam

The purification of iron ore (Ayam) is carried out by soak it in fruit juice of syzygium cumini and kept in the sunlight to get dried. This process is repeated for six times.

- ***Gunapadam thathu jeeva Vagupu*, pg: 91**

Veeram

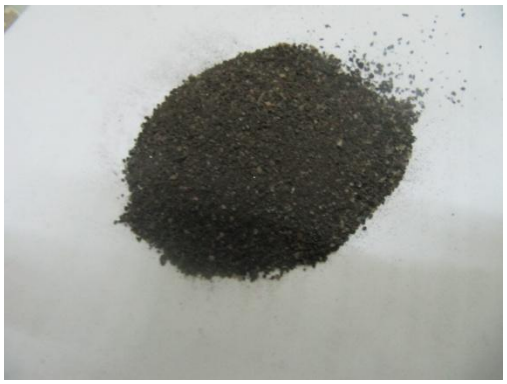
Take Veeram and Piper nigrum seeds in the ratio of 1:3.Ground the seeds with rice pottridge until paste form. Gently cover the veeram with that paste and tie with a white cloth. Sufficient quantity of tender coconut water is add in to a mud pot. By the method of thulaiyandram, prepared veeram was tied witout dipping into the tender coconut water and heat for 1$_{1/2}$ hours (1/2 samam).

***Sikicha rathina deepam*, pg. no 37**

Sunnambu thelineer

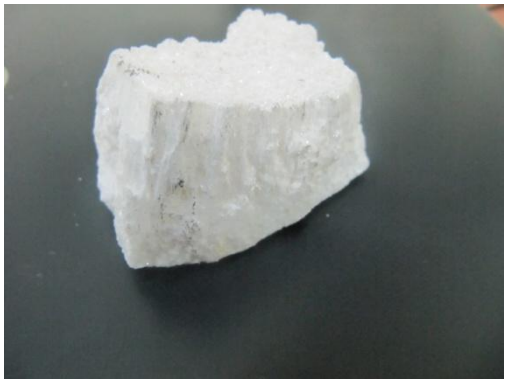
Mix the oyster shell with water in the ratio of 1:4, leave it for 4 hours until sedimentation. Finally gently take the upper zone of water without vigorous mixing.

Unpurified ayam



purified ayam

Unpurified veeram



purified veeram

Oyster shell powder

Ayaveera chendhuram

Preparation of the medicine:

Method of Preparation:

Purified *Ayam* and Purified *Veeram* is taken which should placed in the *kalvam* and ground it with adding sufficient quantity of *sunnambu theli neer* until 4 *samam*, made it in to a single pellet and dried under the sunlight. Then Pellet was placed in the mud plate and closed it with similar mud plate. The margins are covered with 5 layers of clay cloth, dried and kept in the pit under earth. *Pudam* is made with cow dung cakes(the weight of the cow dung measures 25 times weight of the prepared mud pot). Next morning on being cooled mud plate is removed and processed *aya veera chendhurum* is collected in a container. It must be identified by observing colour which will resemble like the flower of the *Butea frontosa*.

Dose of drug : Two – four *kundri*(Abrus seed) (120 -520mg)

Adjuvant : Honey, palmjaggery

Therapeutic uses : Eight types of *Gunmam,mega vayu, mega pidipu, pakkavatham, oduvayu, pakkasoolai,mega soolai.*

Precautions : Ichha pathiyam

Anupoga vaithya navaneetham 1 part, pg. no 113

QUALITATIVE ANALYSIS - PHYSICO-CHEMICAL PROPERTIES

COLOUR

About 50 gm of **AVC** was taken in a clean glass beaker and tested for its colour by viewing against a white opaque back ground under direct sunlight.

ODOUR

About 50 gm of the **AVC** was placed in 100 ml of beaker and tested for its odour by wafting the air above the beaker.

pH

The pH of the **AVC** was estimated as per the method prescribed in the Indian standard (IS) - 6940(1982). One gram of the **AVC** was taken into a 100ml graduated cylinder containing about 50 ml of water and filled up to the mark with water. The cylinder was stopped and shaken vigorously for two minutes and the suspension was allowed to settle for an hour at 25 to 27˚C. About 25 ml of the clear aqueous solution was transferred into a 50 ml beaker and tested for pH using DIGISUN digital pH meter (DIGISUN electronics, Hyderabad, India)

DETERMINATION OF ASH VALUE

Two gms of the **AVC** was weighed accurately in tarred platinum or silica dish and incinerated at a temperature not exceeding 450˚C until free from carbon, then cooled and weighed. Calculate the percentage of ash with reference of the air dried drug.

WATER SOLUBLE ASH

To the Gooch crucible containing the total ash, 25 ml of water was added and boiled for 5 minutes. The insoluble matter was collected in a sintered glass crucible or on ash less filter paper. Washed with hot water and ignited in a crucible for 15 minutes at a temperature not exceeding 450˚c. Subtract the weight of the insoluble matter from the weight of the ash. The difference of the weight represents the water soluble ash. Calculate the percentage of water soluble ash with reference to the air dried drug.

ACID INSOLUBLE ASH

Ash was boiled for 5 minutes with 25 ml of 1:1 diluted. Hcl. The insoluble matter was collected in a Gooch crucible and placed on an ash less filter paper, washed with water and then ignited. Finally cooled in a desiccators and weighed. The percentage of insoluble ash was calculated with reference to the air dried drug.

LOSS ON DRYING

Five grams of the **AVC** was heated in a hot air at 105˚c to a constant weight. The percentage loss of weight was calculated as per procedure.

BIO -CHEMICAL ANALYSIS OF AYAVEERA CHENDHURAM –

ANALYSED AT NATIONAL INSTITUTE OF SIDDHA

Appearance of sample		**Dark brown in colour**	
S. no	EXPERIMENT	OBSERVATION	INFERENCE
1.	**Solubility:** a. A little (500mg) of the sample is shaken well with distilled water. b. A little (500mg) of the sample is shaken well with con. HCl/Con. H_2So_4	Sparingly soluble	Presence of Silicate
2.	**Action of Heat:** A small amount (500mg) of the sample is taken in a dry test tube and heated gently at first and then strong.	No White fumes evolved	Absence of Carbonate
3.	**Flame Test:** A small amount (500mg) of the sample is made into a paste with con. HCl in a watch glass and introduced into non-luminous part of the Bunsen flame.	No Bluish green flame appeared	Absence of copper
4.	**Ash Test:** A filter paper is soaked into a mixture of sample and dil. cobalt nitrate solution and introduced into the Bunsen flame and ignited	Yellow colour flame appeared	presence of Sodium

Preparation of Extract:

5gm of Ayaveera chenduram is weighed accurately and placed in a 250ml clean beaker and added with 50ml of distilled water. Then it is boiled well for about 10 minutes. Then it is cooled and filtered in a 100ml volumetric flask and made up to 100ml with distilled water.

I.Test For Acid Radicals			
S. no	**EXPERIMENT**	**OBSERVATION**	**INFERENCE**
1	**Test For Sulphate :** 2ml of the above prepared extract is taken in a test tube to this added 2ml of 4%dil. ammonium oxalate solution.	No cloudy appearance appeared	Absence of sulphate
2	**Test For Chloride:** 2ml of the above prepared extracts is added with 2ml of dil-HCl is added until the effervescence ceases off.	No cloudy appearance appeared	Absence of chloride
3	**Test For Phosphate:** 2ml of the extract is treated with 2ml of ammonium molybdate solution and 2ml of con.HNO_3	Mild yellow appearance present	Presence of Phosphate
4	**Test For Carbonate:** 2ml of the extract is treated with 2mldil. magnesium sulphate solution	No Cloudy appearance seen	Absence of Carbonate
5	**Test For Fluoride & Oxalate:** 2ml of extract is added with 2ml of dil. Acetic acid and 2ml dil.calcium chloride solution and heated.		

6	**Test For Nitrate:** 1gm of the substance is heated with copper turning and concentrated H2SO4 and viewed the test tube vertically down	No brown gas evolved	Absence of nitarte
7	**Test For Sulphide:** 1gm of the substance is treated with 2ml of con. HCL	No Rotten Egg Smelling gas evolved	Absence of sulphide
8	**Test For Nitrite:** 3drops of the extract is placed on a filter paper, on that-2 drops of dil.acetic acid and 2 drops of dil. Benzidine solution is placed.	No characteristic changes	Absence of Nitrite
9	**Test For Borate:** 2 Pinches (50mg) of the substance is made into paste by using dil.sulphuric acid and alcohol (95%) and introduced into the blue flame.	Bluish green colour flame not appeared	Absence Of Borate
II. Test For Basic Radicals			
1	**Test For Lead:** 2ml of the extract is added with 2ml of dil.potassium iodine solution.	No Yellow Precipitate is obtained.	Absence of lead
2	**Test For Copper:** One pinch (50mg) of substance is made into paste with con. HClin a watch glass and introduced into the non-luminuous part of the flame.	No blue colour Precipitate formed.	Absence of Copper

3	**Test For Aluminium:** To the 2ml of extract dil.sodium hydroxide is added in 5 drops to excess.	No Yellow colour appeared	Absence of Aluminium
4	**Test For Iron:** a. To the 2ml of extract add 2ml of thiocyanate ammonium solution b. To the 2ml of extract add 2ml of thiocyanate ammonium solution and 2ml of con HNO_3 .	Red colour appeared	Presence of iron
5	**Test For Zinc:** To 2ml of the extract dil.sodium hydroxide solution is added in 5 drops to excess and dil.ammonium chloride is added.	White precipitate is not formed	Absence of Zinc
6	**Test For Calcium:** 2ml of the extract is added with 2ml of 4% dil.ammonium oxalate solution	Cloudy appearance and white precipitate is obtained	Presence of Calcium
7	**Test For Magnesium:** To 2ml of extract dil.sodium hydroxide solution is added in drops to excess.	White precipitate is obtained	Presence Of Magnesium
8	**Test For Ammonium:** To 2ml of extract 1 ml of Nessler's reagent and excess of dil.sodium hydroxide solution are added.	No Brown colour appeared	Absence of Ammonium

9	**Test For Potassium:** A pinch (25mg) of substance is treated off with 2ml of dil.sodium nitrite solution and then treated with 2ml of dil.cobalt nitrate in 30% dil.glacial acetic acid.	No yellowish precipitate is obtained	Absence of Pottasium
10	**Test For Sodium**: 2 pinches (50mg) of the substance is made into paste by using HCl and introduced into the blue flame of Bunsen burner.	Yellow colour flame appeared	Presence of sodium
11	**Test For Mercury**: 2ml of the extract is treated with 2ml of dil.sodium hydroxide solution.	Yellow precipitate is obtained	Presence of Mercury
12	**Test For Arsenic:** 2ml of the extract is treated with 2ml of dil.sodium hydroxide solution.	No Brownish red obtained	Absence of Arsenic
III.Miscellaneous			
1	**Test For Starch:** 2ml of extract is treated with weak dil.iodine solution	No blue colour devolopped	Absence of Starch
2	**Test For Reducing Sugar:**5ml of Benedict's qualitative solution is taken in a test tube and allowed to boil for 2 minutes and added 8 to 10 drops of the extract and again boil it for 2 minutes. The colour changes are noted	Brick red colour not devolopped	Absence of reducing sugar

3	**Test For The Alkaloids:** a) 2ml of the extract is treated with 2ml of dil.potassium lodide solution. b) 2ml of the extract is treated with 2ml of dil.picric acid. c) 2ml of the extract is treated with 2ml of dil.phosphotungstic acid.	Yellow colour not developed	Absence of alkaloid
4	**Test For Tannic Acid:** 2ml of extract is treated with 2ml of dil.ferric chloride solution	black precipitate obtained	presence of Tannic acid
5	**Test For Unsaturated Compound:** To the 2ml of extract 2ml of diluted Potassium permanganate solution is added.	Potassium permanganate solution is decolourised	Presence of Unsaturated compounds
6	**Test For Amino Acid:** 2 drops of the extract is placed on a filter paper and dried well. 20ml of Biurette reagent is added.	Violet colour not developed	Absence of Aminoacid
7	**Test For Type Of Compound:** 2ml of the extract is treated with 2 ml of dil.ferric chloride solution.	No Brown colour developed	Absence of Oay quinole, Pinephrine and Pyro catechol

1.**INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION SPECTROMETRY (ICP-OES)**

Introduction

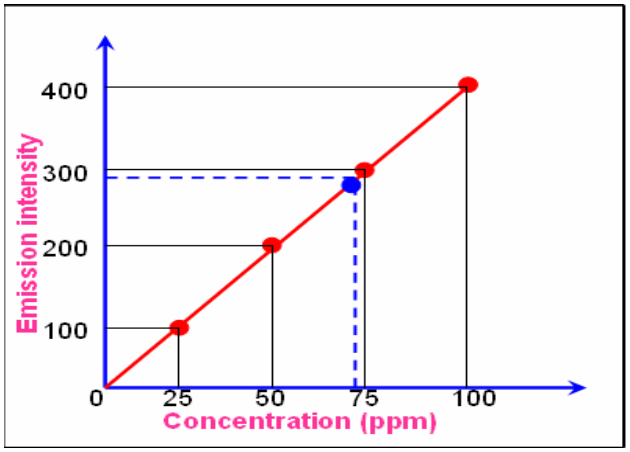
The elemental composition of a sample is often an important part of the information needed to assess its properties. Hence there is a need for sensitive scientific instrumentation like ICP-OES which plays a pivotal role in the determination of these elements. ICP-OES is widely employed for the estimation of metals and metalloids at trace, minor and major concentrations.

Principle

In this technique, the high temperature plasma source atomizes the sample and excites the atoms resulting in emission of photons .The atoms of each element in the sample emit specific wavelength of light. The emission spectrum from the plasma is dispersed by an optical spectrometer, so that intensities of the individual wavelength can 64 be measured. The number of photons emitted is directly proportional to the concentration of the element. The photon may be detected either sequentially or simultaneously. Quantitative analysis is achieved by measuring the intensity of these specific wavelengths and after performing the calibration using known standards.

Extraction of information

Obtaining qualitative information, i.e., what elements are present in the sample, involves identifying the presence of emission at the wavelengths characteristic of the elements of interest. Obtaining quantitative information, i.e., how much of an element is in the sample, can be accomplished using plots of emission intensity versus concentration called calibration curves. Typical calibration graph is illustrated below



Experimental Procedure: Done at SAIF, IIT Madras, Chennai-36

Sample preparation – Microwave Digestion Weigh 0.25g of test sample and transfer into a liner provided with the instrument. Slowly add 9ml of Nitric acid or Sulphuric acid such that no piece of sample sticks on the slides. Mix thoroughly and allow reacting for few minutes. Place the liner in the vessel jacket. Close the screw cap hand-tight in clockwise direction. Seal the vessel and place in the rotor fixed in microwave. Set temperature to 180°C for 5 minutes; hold at 180°C for least 10 minutes. Allow the vessels to cool down to a vessel interior temperature below 60°C and to a vessel surface temperature (IR) below 50°C before removing the rotor. The digested sample was made upto 100ml with millipore water. If visible insoluble particles exist, solution could be filtered through whatmann filter paper. Transfer the digested solution into plastic containers and label them properly.

2.SCANNED ELECTRON MICROSCOPY (SEM)

A SEM is essentially a high magnification microscope, which uses a focussed scanned electron beam to produce images of the sample, both top-down and, with the necessary sample preparation, cross-sections. The primary electron beam interacts with the sample in a number of key ways:-

- ❖ Primary electrons generate low energy secondary electrons, which tend to emphasize the topographic nature of the specimen.
- ❖ Primary electrons can be backscattered which produces images with a high degree of atomic number (Z) contrast.

- ❖ Ionized atoms can relax by electron shell-to-shell transitions, which lead to either X-ray emission or Auger electron ejection. The X-rays emitted are characteristic of the elements in the top few μm of the sample.

The SEM is carried out by using FEI-Quanta FEG 200-High Resolution Instrument.
Resolution: 1.2 nm gold particle separation on a carbon substrate
Magnification: From a min of 12x to greater than 1, 00,000 X
Application: To evaluate grain size, particle size distributions, material homogeneity and inter metallic distributions.

Experimental Procedure: Done at SAIF, IIT Madras, Chennai-36
Sample preparation: Sample preparation can be minimal or elaborate for SEM analysis, depending on the nature of the samples and the data required. Minimal preparation includes acquisition of a sample that will fit into the SEM chamber and some accommodation to prevent charge build-up on electrically insulating samples. Most electrically insulating samples are coated with a thin layer of conducting material, commonly carbon, gold, or some other metal or alloy. The choice of material for conductive coatings depends on the data to be acquired: carbon is most desirable if elemental analysis is a priority, while metal coatings are most effective for high resolution electron imaging applications. Alternatively, an electrically insulating sample can be examined without a conductive coating in an instrument capable of "low vacuum" operation.

3. FOURIER TRANSFORM - INFRA RED SPECTROSCOPY

PERKIN ELMER – SPECTRUM ONE

Introduction

Vibrational spectroscopy is an extremely useful tool in the elucidations of molecular structure. The spectral bands can be assigned to different vibrational modes of the molecule. The various functional groups present in the molecule can be assigned by a comparison of the spectra with characteristic functional group frequencies. As the positions of the bands are directly related to the strength of the chemical bond, a large number of investigations including intermolecular interactions,

phase transitions and chemical kinetics can be carried out using this branch of spectroscopy.

In IR spectroscopy, the resonance absorption is made possible by the change in dipole moment accompanying the vibrational transition. The Infrared spectrum originates from the vibrational motion of the molecule. The vibrational frequencies are a kind of fingerprint of the compounds. This property is used for characterization of 60 organic, inorganic and biological compounds. The band intensities are proportional to the concentration of the compound and hence qualitative estimations are possible. The IR spectroscopy is carried out by using Fourier transform technique.

Principle

Infra red spectroscopy involves study of the interaction of electromagnetic radiation with matter. Due to this interaction, electromagnetic radiation characteristic of the interacting system may be absorbed (or emitted). The experimental data consist of the nature (frequency of wave length) and the amount (intensity) of the characteristic radiation absorbed or emitted. These data are correlated with the molecular and electronic structure of the substance and with intra- and inter molecular interactions.

FT-IR spectroscopy is used primarily for qualitative and quantitative analysis of organic compounds, and also for determining the chemical structure of inorganic materials. The region between 500-4000 wave numbers is referred to as the finger print region. Absorption bands in this region are generally due to **intra molecular** phenomena and are highly specific for each material. The specificity if these bands allow computerized data searches to be performed against reference libraries to identify a material.

Table of Characteristic IR Absorptions

Frequency, cm–1	Bond	Functional group
3640–3610 (s, sh)	O–H stretch,	free hydroxyl alcohols, phenols
3500–3200 (s,b)	O–H stretch, H–bonded	alcohols, phenols
3400–3250 (m)	N–H stretch	primary, secondary amines, amides
3300–2500 (m)	O–H stretch	carboxylic acids
3330–3270 (n, s)	–C(triple bond)C–H: C–H stretch	alkynes (terminal)
3100–3000 (s)	C–H stretch	Aromatics
3100–3000 (m)	=C–H stretch	Alkenes
3000–2850 (m)	C–H stretch	Alkanes
2830–2695 (m)	H–C=O: C–H stretch	Aldehydes
2260–2210 (v)	C(triple bond)N stretch	Nitriles
2260–2100 (w)	–C(triple bond)C– stretch	Alkynes
1760–1665 (s	C=O stretch	carbonyls (general)
1760–1690 (s)	C=O stretch	carboxylic acids
1750–1735 (s)	C=O stretch	esters, saturated aliphatic
1740–1720 (s)	C=O stretch	aldehydes, saturated aliphatic
1730–1715 (s)	C=O stretch	alpha,beta–unsaturated esters
1715 (s)	C=O stretch	ketones, saturated aliphatic
1710–1665 (s)	C=O stretch	alpha,beta–unsaturated aldehydes, ketones
1680–1640 (m)	–C=C– stretch	Alkenes
1650–1580 (m)	N–H bend	primary amines
1600–1585 (m)	C–C stretch (in–ring)	Aromatics

1550–1475 (s)	N–O asymmetric stretch	nitro compounds
1500–1400 (m)	C–C stretch (in–ring)	Aromatics
1470–1450 (m)	C–H bend	Alkanes
1370–1350 (m)	C–H rock	Alkanes
1360–1290 (m)	N–O symmetric stretch	nitro compounds
1335–1250 (s)	C–N stretch	aromatic amines
1320–1000 (s)	C–O stretch	alcohols, carboxylic acids, esters, ethers
1300–1150 (m)	C–H wag (–CH2X)	alkyl halides
1250–1020 (m)	C–N stretch	aliphatic amines
1000–650 (s)	=C–H bend	Alkenes
950–910 (m)	O–H bend	carboxylic acids
910–665 (s, b)	N–H wag	primary, secondary amines
900–675 (s)	C–H "oop"	Aromatics
850–550 (m)	C–Cl stretch	alkyl halides
725–720 (m)	C–H rock	Alkanes
700–610 (b, s)	–C(triple bond)C–H: C–H bend	Alkynes
690–515 (m)	C–Br stretch	alkyl halides

m=medium, w=weak, s=strong, n=narrow, b=broad, sh=sharp

Sampling techniques:

There are a variety of techniques for sample preparation depending on the physical form of the sample to be analyzed.

Solid	:	KBr or Nujol mull method.
Liquid	:	CsI / TlBr Cells
Gas	:	Gas cells

Experimental Procedure: Done at SAIF, IIT Madras, Chennai-36

KBr Method

- ✓ The sample was grounded using- an agate mortar and pestle to give a very fine powder.
- ✓ The finely powder sample was mixed with about 100mg dried KBr salt.
- ✓ The mixture was then pressed under hydraulic press using a die to yield a transparent disc (measure about 13mm diameter and 0.3mm in thickness), through which the beam of spectrometer passed.

4. X-Ray Fluorescence (XRF)

An X-ray fluorescence (XRF) spectrometer is an x-ray instrument used for routine, relatively non-destructive chemical analyses of rocks, minerals, sediments and fluids. It works on wavelength-dispersive spectroscopic principles that are similar to an electron microprobe (EPMA). However, an XRF cannot generally make analyses at the small spot sizes typical of EPMA work (2-5 microns), so it is typically used for bulk analyses of larger fractions of geological materials. The relative ease and low cost of sample preparation, and the stability and ease of use of x-ray spectrometers make this one of the most widely used methods for analysis of major and trace elements in rocks, minerals, and sediment.

Fundamental Principles of X-Ray Fluorescence (XRF)

The XRF method depends on fundamental principles that are common to several other instrumental methods involving interactions between electron beams and x-rays with samples, including: X-ray spectroscopy (e.g., SEM - EDS), X-ray diffraction (XRD), and wavelength dispersive spectroscopy. Analysis of major and trace elements in geological materials by x-ray fluorescence is made possible by the behavior of atoms when they interact with radiation. When materials are excited with

high-energy, short wavelength radiation (e.g., X-rays), they can become ionized. If the energy of the radiation is sufficient to dislodge a tightly-held inner electron, the atom becomes unstable and an outer electron replaces the missing inner electron. When this happens, energy is released due to the decreased binding energy of the inner electron orbital compared with an outer one. The emitted radiation is of lower energy than the primary incident X-rays and is termed fluorescent radiation. Because the energy of the emitted photon is characteristic of a transition between specific electron orbitals in a particular element, the resulting fluorescent X-rays can be used to detect the abundances of elements that are present in the sample.

Procedure

The analysis of major and trace elements in geological materials by XRF is made possible by the behavior of atoms when they interact with X-radiation. An XRF spectrometer works because if a sample is illuminated by an intense X-ray beam, known as the incident beam, some of the energy is scattered, but some is also absorbed within the sample in a manner that depends on its chemistry. The incident X-ray beam is typically produced from a Rh target, although W, Mo, Cr and others can also be used, depending on the application.

When this primary X-ray beam illuminates the sample, it is said to be excited. The excited sample in turn emits X-rays along a spectrum of wavelengths characteristic of the types of atoms present in the sample. How does this happen? The atoms in the sample absorb X-ray energy by ionizing, ejecting electrons from the lower (usually K and L) energy levels. The ejected electrons are replaced by electrons from an outer, higher energy orbital. When this happens, energy is released due to the decreased binding energy of the inner electron orbital compared with an outer one. This energy release is in the form of emission of characteristic X-rays indicating the type of atom present. If a sample has many elements present, as is typical for most

minerals and rocks, the use of a Wavelength Dispersive Spectrometer much like that in an EPMA allows the separation of a complex emitted X-ray spectrum into characteristic wavelengths for each element present. Various types of detectors (gas flow proportional and scintillation) are used to measure the intensity of the emitted beam. The flow counter is commonly utilized for measuring long wavelength (>0.15 nm) X-rays that are typical of K spectra from elements lighter than Zn. The scintillation detector is commonly used to analyze shorter wavelengths in the X-ray spectrum (K spectra of element from Nb to I; L spectra of Th and U). X-rays of intermediate wavelength (K spectra produced from Zn to Zr and L spectra from Ba and the rare earth elements) are generally measured by using both detectors in tandem. The intensity of the energy measured by these detectors is proportional to the abundance of the element in the sample. The exact value of this proportionality for each element is derived by comparison to mineral or rock standards whose composition is known from prior analyses by other techniques.

X-Ray fluorescence is particularly well-suited for investigations that involve

- ✓ bulk chemical analyses of major elements (Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K, P) in rock and sediment
- ✓ bulk chemical analyses of trace elements (in abundances >1 ppm; Ba, Ce, Co, Cr, Cu, Ga, La, Nb, Ni, Rb, Sc, Sr, Rh, U, V, Y, Zr, Zn) in rock and sediment - detection limits for trace elements are typically on the order of a few parts per million
- ✓ X-ray fluorescence is limited to analysis of
- ✓ relatively large samples, typically > 1 gram
- ✓ materials that can be prepared in powder form and effectively homogenized
- ✓ materials for which compositionally similar, well-characterized standards are available
- ✓ materials containing high abundances of elements for which absorption and fluorescence effects are reasonably well understood

In most cases for rocks, ores, sediments and minerals, the sample is ground to a fine powder. At this point it may be analyzed directly, especially in the case of trace element analyses. However, the very wide range in abundances of different elements,

especially iron, and the wide range of sizes of grains in a powdered sample, makes the proportionality comparison to the standards particularly troublesome. For this reason, it is common practice to mix the powdered sample with a chemical flux and use a furnace or gas burner to melt the powdered sample. Melting creates a homogenous glass that can be analyzed and the abundances of the (now somewhat diluted) elements calculated.

Strengths

X-Ray fluorescence is particularly well-suited for investigations that involve:

- ✓ bulk chemical analyses of major elements (Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K, P) in rock and sediment
- ✓ bulk chemical analyses of trace elements (>1 ppm; Ba, Ce, Co, Cr, Cu, Ga, La, Nb, Ni, Rb, Sc, Sr, Rh, U, V, Y, Zr, Zn) in rock and sediment

Experimental Procedure: Done at Sastra university, Tanjore.

TOXICOLOGICAL EVALUATION OF AYAVEERA CHENDHURAM

SCOPE OF WORK

Preclinical drug development is a stage that begins before clinical trials during which important safety and pharmacology data are collected. Regulatory toxicity studies are conducted in animals to identify possible hazards from which an assessment of risk to humans is made by extrapolation. The choice of animal species is based on the similarities of its metabolism to humans

The goals of the non clinical safety evaluation includes

- Categorization of toxic effects with respect to target organs, dose dependence, relationship to exposure and potential reversibility. This information is important for the estimation of an initial safe starting dose for the human trial
- The identification of specific parameters for clinical monitoring for potential adverse effect

Systemic toxicity studies

Single dose study

Single dose studies (acute toxicity) in animals are essential for any pharmaceutical products intended for human use .the information obtained from these studies is useful in choosing doses for repeated dose studies, providing preliminary identification of target organs of toxicity and occasionally revealing delayed toxicity. Acute toxicity studies may also aid in the selection of starting doses for phase I human studies and provide information relevant to acute over dosing in humans

Repeated dose systemic toxicity studies

The primary goal of repeated dose toxicity studies is to characterize the toxicological profile of the cell compound following repeated administration. This includes identification of potential target organs of toxicity and exposure /response relationship and may include the potential reversibility of toxic effects. This information should be part of the safety assessment to support the conduct of human clinical trials and the approval of marketing authorization.

PLAN OF WORK

The following studies carried out in AVC are

Acute oral toxicity study – OECD 423 guideline

28 days Repeated oral toxicity study – OECD 407 guideline

TEST DRUG – AYAVEERA CHENDHURAM

The toxicity studies were evaluated after getting permission from the Institutional Animal Ethical Committee certificate. **(1248/ac/09/CPCSEA/4-34/ 2011).**

ACUTE TOXICITY STUDY OF AYAVEERA CHENDHURAM

PRINCIPLE OF THE TEST

It is the principle of the test that, based on a stepwise procedure with the use of a minimum number of animals per step, sufficient information is obtained on the acute toxicity of the test substance to enable its classification. The substance is administered orally to a group of experimental animals at one of the defined doses. The substance is tested using a stepwise procedure, each step using three animals of a single sex (normally females). Absence or presence of compound-related mortality of the animals dosed at one step will determine the next step, i.e.;

− no further testing is needed,

− dosing of three additional animals, with the same dose

− dosing of three additional animals at the next higher or the next lower dose level

Experimental animal:

Species and strain	:	Wister Albino rat
Sex	:	Male and female
Age/Weight	:	6 weeks/150-200 gm
Test guideline	:	OECD guidelines - 423
Groups/treatment	:	Grouped by randomization
Duration of exposure to *"Ayaveera chendhuram"*	:	Single dose
Study duration	:	14 days
Number of animals	:	6/group, 3/sex
Route of administration	:	Oral

Groups	No of Rat
Group I control	3 female
Group II test drug – 5mg/kg b.wt	3 female
Group III test drug– 50 mg/kg b.wt	3 female
Group IV test drug – 300 mg/kg b.wt	3 female
Group V test drug – 2000 mg/kg b.wt	3 female

Acute oral toxicity of the formulations were evaluated in rats following OECD guideline - 423. Animals were divided into five groups, each group containing 3 females; weight: 150 - 200g; age: 6 weeks. One group served as control and the others for test drug at four different doses (5mg, 50mg, 300mg, 2000mg /kg.b.w) by oral gavage.

TEST ANIMALS

Test animals were obtained from srinivasa animal laboratory, Bangalore and kept at animal house, National Institute of Siddha, Chennai. All the animals were kept under standard environmental condition (22 ± 3˚c).The animals had free access to water and standard pellet diet (Sai Meera foods pvt. Ltd, Bangalore). The principles of laboratory animal care were followed.

IDENTIFICATION OF ANIMAL:

By cage number and individual marking on the fur of each animals with picric acid.

HOUSING & ENVIRONMENT:

The animals were housed in polypropylene cages provided with bedding of husk.

ROUTE OF ADMINISTRATION:

Oral route was selected, because it is the normal route of clinical administration.

TEST SUBSTANCE AND VEHICLE

The *Ayaveera chendhuram* is dark brown coloured, without taste and odour. The test substance is insoluble in water. In order to obtain and ensure the uniformity in drug distribution; the drug is dissolved by 10% aqueous tween 80 solution.

ADMINISTRATION OF DOSES

Ayaveera chendhuram was suspended in 10% aqueous tween 80 solution with uniform mixing and it was administered to the test groups in a single oral dose. The control groups were received equal volume of the vehicle. The animals were weighed before giving the drug. Test drug at four different doses (5mg, 50mg, 300mg, 2000mg /kg.b.w) was administered by oral gavage.

OBSERVATION:

a. Behaviour:

The animals were observed closely for behaviour in the first four hours which includes abnormal gait, aggressiveness, exophthalmos , ptosis , akinesia, catalepsy, convolusion, excitation, head twitches, lacrimation, loss of corneal reflex, loss of traction, piloerection reactivity of touch, salivation, scratching, sedation, stereotypes (chewing), stereotypes(head movements), stereotypes (sniffing), straub, tremor and writhes, diarrhea, leathery, sleep and coma.(Table.8)

b. Body weight

Body weights were recorded at day 1, 2, 7 and 14 of the study.

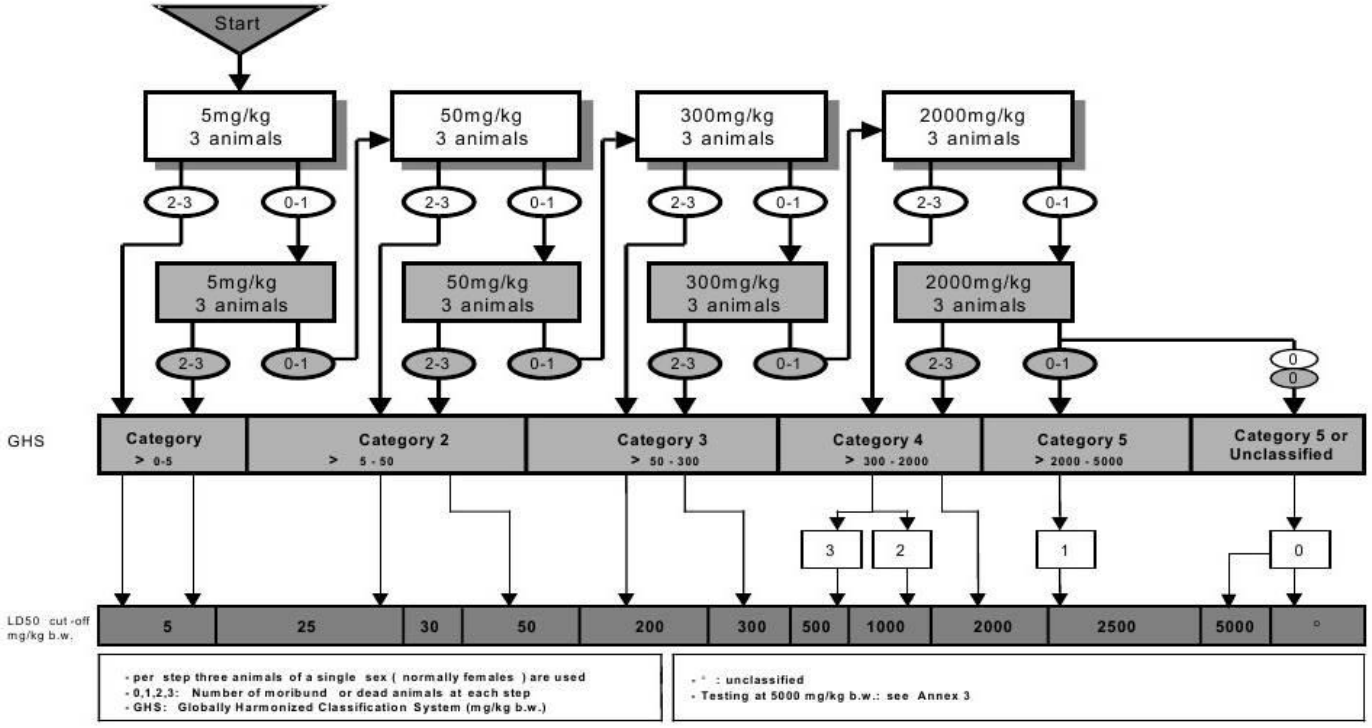
c. Mortality :

Animals were observed for mortality throughout the entire period.

d. Gross necropsy:

At 14^{th} day animals were sacrificed for gross necropsy. It includes examination of the external surface of the body, all orifices, and organs like brain, thymus, lungs, heart, spleen, liver, kidneys, adrenals and sex organs of all animals.

ANNEX 2a: TEST PROCEDURE WITH A STARTING DOSE OF 5 MG/KG BODY WEIGHT



REPEATED ORAL TOXICITY STUDY OF AYAVEERA CHENDHURAM

Species and strain	:	Wister albino rats
Sex	:	Male and Female
Age/Weight	:	6 weeks/150-200mg
Test guideline	:	OECD guidelines – 407
Groups/treatment	:	Grouped by randomization
Duration	:	28 days
Number of animals	:	10/group (5/sex)
Route of administration	:	Oral

Groups	No of Rats
Group I control	6 (3male,3 female)
Group II test drug - low dose(18.72mg)	6 (3male,3 female)
Group III test drug - Mid dose(93.65mg)	6 (3male,3 female)
Group IV test drug - High dose(187.2mg)	6(3male, 3 female)

The study will be carried out as per OECD Guideline 407 (Repeated Dose 28-Day Oral Toxicity in Rodents). The animals will be divided in four groups each group consist of 6 animals (3 males and 3 females). One group will serve as control and the other three groups for test drug at three dose levels (low, mid and high) for 28 days.

ANIMAL SOURCE:

Test animals were obtained from The King Institute, Chennai, and kept at animal house, National Institute of Siddha, Chennai. All the animals were kept under standard environmental condition (22 ± 3ºc) .The animals had free access to water and standard pellet diet (Sai Meera foods pvt. Ltd, Bangalore). The principles of laboratory animal care were followed.

RANDOMIZATION, NUMBERING AND GROUPING OF ANIMAL

The animals were randomly divided into four groups. Each group consist of 6 animals (3 per sex in each group) first group was kept as control and remaining groups as test were treated with test drug in different doses. The animals were allowed for an acclimatization period of 7 days to laboratory conditions prior to the initiation of treatment. The females were nulliparous and non pregnant.

IDENTIFICATION OF ANIMAL:

Animals were identified by cage number and individual marking on the fur of each animal with picric acid.

HOUSING & ENVIRONMENT:

The animals were housed in polypropylene cages provided with bedding of husk. Dark and light cycle each of 12 hours was maintained.

ADMINISTRATION PERIOD:

28 days

DOSE SELECTION:

Repeated oral toxicity study was carried out at different dose levels (18.72 mg, 93.6 mg and 187.2). The selected doses were calculated according to body weight and surface area of rat. The human therapeutic dose of AVC is 1040mg/day.

PREPARATION AND ADMINISTRATION OF DOSE

AVC was suspended in 10% aqueous tween 80 solution. It was administered to groups I, II, III at dose levels of X therapeutic dose (18.72mg/animal), 5 X therapeutic doses (93.6mg/animal) and 10 X therapeutic dose (187.2mg/animal). The control animals were administered vehicle only. Administration was given orally using an oral gavage once in daily for 28 days.

Observations:

BODY WEIGHT:

During the study, Body weight of the animals was evaluated weekly (Table.9)

FOOD AND WATER INTAKE:

Water and food consumption was evaluated daily (Table.10)

MORTALITY:

Animals were observed for mortality daily.

LABORATORY INVESTIGATIONS:

Collection of blood:

Blood was collected in all overnight (12 hours) fasted rats through cardiac puncture method and it will be processed for below mentioned investigations.

Laboratory test:

Complete haemogram

Renal function test

Liver function test

NECROPSY:

By the end of 28 days, the animals were sacrificed by excessive anesthesia. Animals were subjected to gross necropsy. Vital organs collected from the animals were subjected to histopathology.

HISTOPATHOLOGY:

Animals were subjected to histopathological investigations. Various organs will be collected from all animals and preserved in 10% buffered neutral formalin, sliced 5 or 6µm sections and it will be stained with hematoxylin and eosin, examined for histopathological changes.

STATISTICAL ANALYSIS:

Findings such as clinical sings of intoxication, body weight changes, food consumption, hematology, and biochemical parameters were subjected to one-way ANOVA followed by Dunnet “t” test using a computer software programme-INSTAT-V3 version.

RESULTS

RESULTS

Table: 1.Physicochemical properties of Ayaveera Chenduram.

S No.	Parameters	Values obtained (%w/w)	Heavy/ toxic metals	
1	Total ash value	8.33	Lead	BDL
2	Acid insoluble ash	0.75	Cadmium	BDL
3	Loss on Drying at 105°C	0.86%		
4	Water soluble ash	6.78	Mercury	BDL
5	Moisture content	10.12	Arsenic	BDL

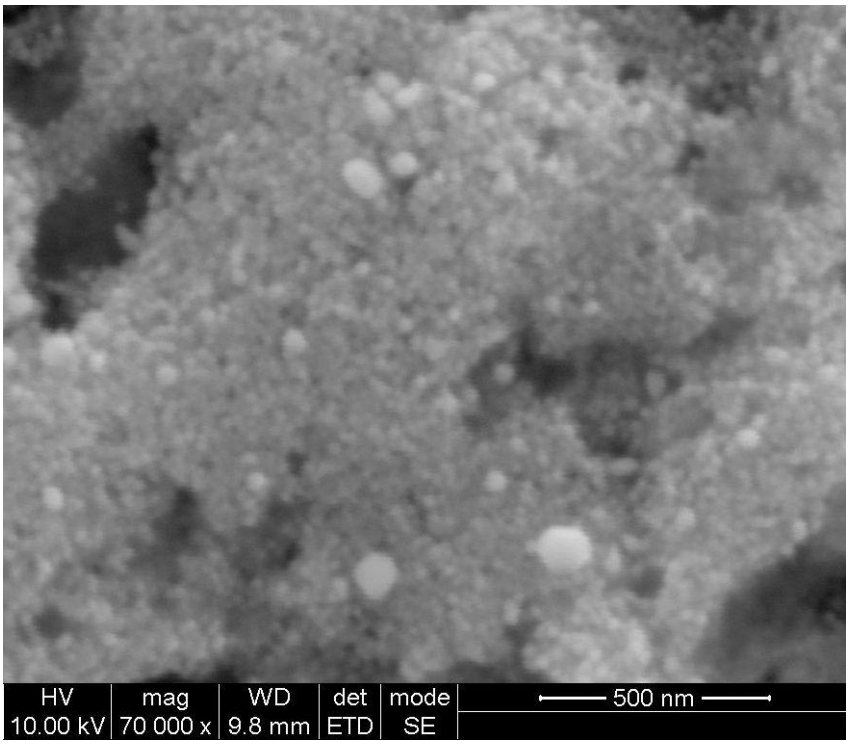
Table: 2 SIEVE ANALYSIS

S.No	Sieve No (µ)	% of particles retained
1.	600	Nil
2.	300	3.2
3.	150	5.92
4.	75	54.74
5.	Final product	34.74

Table: 3 Colour, nature and percent yields of extracts of Ayaveera Chenduram.

S.no.	Extract Solvents	Colour	Nature	% Yield(w/w)	SEM-Micro graph partical size range in Nm	pH
1	Water	Dark brown	**Solid**	49	50 – 100 nm	8.3 – 8.5

Image :1 HR SEM Analysis - Determination of particle size of Ayaveera chenduram



Particle size of aya veera chenduram is approximately measured as 71.42 nm

Table : 4

INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION SPECTROMETRY OF AVC

S. no	Elements	Wavelength in nm	Unpurified ayam (fe) mg/L	Purified ayam (fe) mg/L	Unpurified veeram mg/L	Purified veeram mg/L	Aya veera chendura m mg/L
1	Arsenic	As193.696	BDL	BDL	BDL	BDL	BDL
2	Calcium	Ca 317.933	20.589	2.452	10.942	6.215	9.268
3	Cadmium	Cd 226.502	BDL	BDL	BDL	BDL	BDL
4	Mercury	Hg 253.652	BDL	BDL	124.514	95.362	3.145
5	Iron	Fe 238.204	652.441	523.859	8.145	4.651	192.982
6	Potassium	K 766.490	28.985	16.148	12.658	8.745	7.654
7	Sodium	Na 589.592	20.416	9.245	19.642	11.584	8.884
8	Phosphate	P 213.617	36.125	13.362	30.845	22.685	24.196
9	Lead	Pb 230.204	BDL	BDL	BDL	BDL	BDL
10	Magnesium	Mg 257.610	15.652	9.245	BDL	BDL	4.847
11	Silicon	S 181.975	17.356	8.254	7.519	5.249	7.347
12	Copper	Cu324.754	BDL	BDL	BDL	BDL	BDL

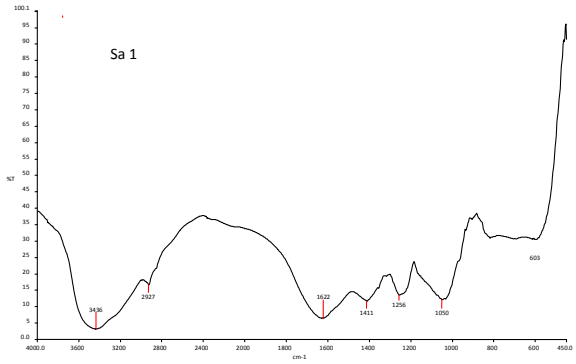
Table: 5

FTIR analysis in the samples of AVC

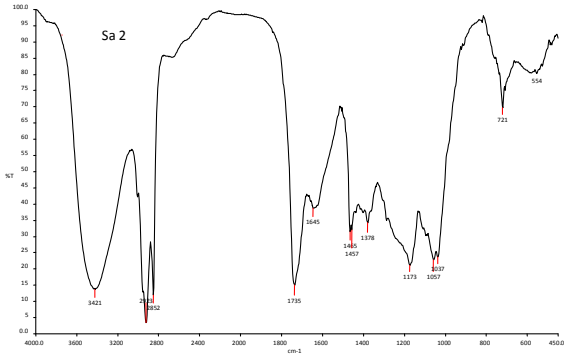
Frequency, cm–1	Unpurified ayam	Purified ayam	Unpurified veeram	Purified veeram	AVC
3640–3610 (s, sh)	-	-	-	-	+
3500–3200 (s,b)	-	-	-	-	-
3400–3250 (m)	+	+	+	+	-
3300–2500 (m)	+	-	+	+	+
3330–3270 (n, s)	-	+	-	-	+
3100–3000 (s)	-	-	-	-	-
3100–3000 (m)	-	-	-	-	-
3000–2850 (m)	+	+	-	+	-
2830–2695 (m)	-	-	-	-	+
2260–2210 (v)	+	-	+	-	-
2260–2100 (w)	-	-	-	-	-
1760–1665 (s)	-	-	-	-	-
1760–1690 (s)	-	+	-	-	-
1750–1735 (s)	-	-	-	-	-
1740–1720 (s)	-	-	-	-	-
1730–1715 (s)	-	-	-	-	-
1715 (s)	-	-	-	-	-
1710–1665 (s)	-	-	-	-	-
1680–1640 (m)	-	-	-	-	-
1650–1580 (m)	-	-	-	-	+
1600–1585 (m)	-	+	-	-	-
1550–1475 (s)	-	-	-	-	-
1500–1400 (m)	-	+	-	-	-
1470–1450 (m)	-	-	-	-	-
1370–1350 (m)	-	-	-	-	-
1360–1290 (m)	-	-	-	-	-
1335–1250 (s)	-	-	-	-	-
1320–1000 (s)	-	-	+	+	-
1300–1150 (m)	-	-	-	-	-
1250–1020 (m)	-	+	+	+	+
1000–650 (s)	+	+	+	+	-
950–910 (m)	-	-	-	-	-
910–665 (s, b)	-	-	+	+	-
900–675 (s)	+	+	+	+	-
850–550 (m)	-	-	+	+	-
725–720 (m)	-	-	-	-	-
700–610 (b, s)	-	-	-	-	+
90–515 (m)	-	-	-	-	-

The schematic graph of FTIR analysis is shown below

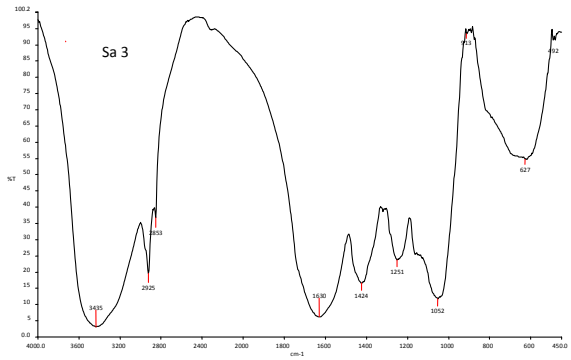
Graph: 1 FTIR analysis of unpurified Ayam(Fe)



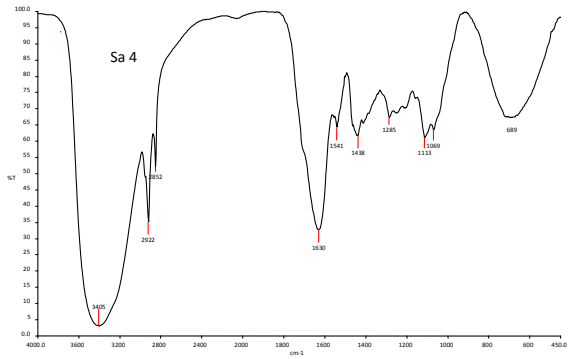
Graph: 2 FTIR analysis of purified Ayam(Fe)



Graph: 3 FTIR analysis of unpurified Veeram



Graph: 4 FTIR analysis of purified Veeram



Graph: 5 FTIR analysis of Ayaveera chendhuram

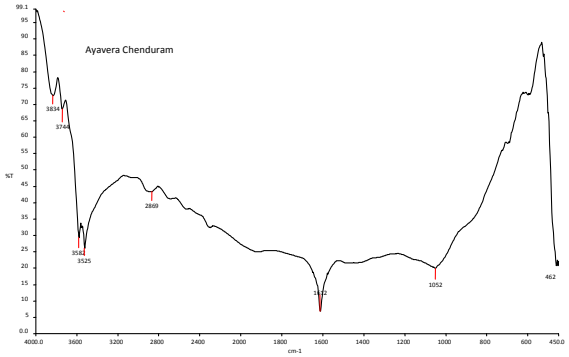


Table: 6 XRFAnalysis of Ayaveera chenduram in elemental form

Formula	Z	Concenteration	Status	line 1	Net.int.	cal.conc
Fe	26	42.05%	XRF 0	Fe KA1-HR-Tr	4935	0.0806%
O	8	37.04%	XRF 0	0 KA1-HR	2.566	9.51%
Si	14	12.51%	XRF 0	Si KA1-HR-Tr	217.6	0.384%
Al	13	3.52%	XRF 0	Al KA1-HR-Tr	46.80	0.832%
Cl	17	1.22%	XRF 0	Cl KA1-HR-Tr	32.52	1.00%
Mn	25	0.83%	XRF 0	Mn KA1-HR-Tr	79.94	0.646%
Ca	20	0.77%	XRF 0	Ca KA1-HR-Tr	34.05	0.977%
Na	11	0.50%	XRF 0	Na KA1-HR-Tr	2.674	4.02%
Ti	22	0.48%	XRF 0	Ti KA1-HR-Tr	29.27	1.07%
Mg	12	0.42%	XRF 0	Mg KA1-HR-Tr	6.788	2.61%
K	19	0.24%	XRF 0	K KA1-HR-Tr	9.256	1.92%
Cr	24	0.15%	XRF 0	Cr KA1-HR-Tr	13.91	1.64%
S	16	0.14%	XRF 0	S KA1-HR-Tr	6.078	2.39%
Hg	80	0.08%	XRF 0	Hg LA1-HR-Tr	6.894	2.95%
Cu	29	0.06%	XRF 0	Cu KA1-HR-Tr	5.453	3.13%
As	33	0.05%	XRF 0	As KA1-HR-Tr	9.736	2.37%
P	15	0.05%	XRF 0	P KA1-HR-Tr	1.033	6.47%
Ba	56	0.04%	XRF 0	Ba LA1-HR-Tr	0.8640	9.40%
Ni	28	0.02%	XRF 0	Ni KA1-HR-Tr	1.593	7.64%
Sr	38	92ppm	XRF 0	Sr KA1-HR-Tr	3.882	6.80%
Zr	40	83ppm	XRF 0	Zr KA1-HR-Tr	4.658	6.57%
Mo	42	77ppm	XRF 0	Mo KA1-HR-Tr	3.957	9.44%

Table:7 XRF Analysis of Ayaveera chenduram in oxide form

Formula	Z	Concenteration	Status	line 1	Net.int.	cal.conc
Fe2o3	26	60.12%	XRF 1	Fe KA1-HR-Tr	4935	0.0806%
Sio2	14	26.77%	XRF 1	Si KA1-HR-Tr	217.6	0.384%
Al2o3	13	6.27%	XRF 1	Al KA1-HR-Tr	46.80	0.832%
Cl	17	1.22%	XRF 1	Cl KA1-HR-Tr	32.52	1.00%
Mno	25	1.08%	XRF 1	Mn KA1-HR-Tr	79.94	0.646%
Cao	20	1.08%	XRF 1	Ca KA1-HR-Tr	34.05	0.977%
Na2o	11	0.68%	XRF 1	Na KA1-HR-Tr	2.674	4.02%
Tio2	22	0.80%	XRF 1	Ti KA1-HR-Tr	29.27	1.07%
Mgo	12	0.70%	XRF 1	Mg KA1-HR-Tr	6.788	2.61%
K2o	19	0.29%	XRF 1	K KA1-HR-Tr	9.256	1.92%
Cr2o3	24	0.22%	XRF 1	Cr KA1-HR-Tr	13.91	1.64%
So3	16	0.35%	XRF 1	S KA1-HR-Tr	6.078	2.39%
Hg	80	0.08%	XRF 1	Hg LA1-HR-Tr	6.894	2.95%
Cuo	29	0.07%	XRF 1	Cu KA1-HR-Tr	5.453	3.13%
As2o3	33	0.06%	XRF 1	As KA1-HR-Tr	9.736	2.37%
P2o5	15	0.11%	XRF 1	P KA1-HR-Tr	1.033	6.47%
Ba0	56	0.04%	XRF 1	Ba LA1-HR-Tr	0.8640	9.40%
Nio	28	0.03%	XRF 1	Ni KA1-HR-Tr	1.593	7.64%
Sro	38	0.01%	XRF 1	Sr KA1-HR-Tr	3.882	6.80%
Zro2	40	0.01%	XRF 1	Zr KA1-HR-Tr	4.658	6.57%
Moo3	42	0.01%	XRF 1	Mo KA1-HR-Tr	3.957	9.44%

TOXICITY STUDY

Acute oral toxicity study

All the data´s were summarized in the form of table (8) showing the animals behavioral signs in control and test groups. There was no mortality at the dose level of 5mg, 50mg, 300mg & 2000mg/Kg b.wt animal.

Long term toxicity study

Clinical signs

No abnormal behavioral signs were observed during the study period.

Mortality

The test drug AVC did not cause any mortality in X (18.72mg/animal), 5X (93.65mg/animal) and 10X (187.2mg/animal) dose levels and were considered as safe dose levels.

Body weight

Both control and test dose groups exhibited normal body weight throughout the study period. (Table.9)

Food consumption

No difference in food intake of control and test group animals observed during the period of study.

Water intake

No difference in water intake of control and test group animals observed during the period of study. (Table10)

Hematological investigations

The results of hematological investigation conducted at the end of the study, test groups revealed no significant changes in values of different parameters, when compared with control group. The Hemoglobin and TRBC count was slightly elevated in test groups, but statistically not significant when compared with control group. (Table 11.)

Biochemical investigations

Biochemical investigations were conducted at the end of the study and the results were recorded. In test groups there was no significant elevation in the levels of biochemical parameters, when compared with the control group. And the values obtained were within normal biological limits.(Table 12)

HISTOPATHOLOGY:

Tissue samples of organs from control and treated animals were preserved in 10% formalin for preparation of sections using microtome. The organs included liver, kidneys, heart, lungs and stomach of the animals were preserved and they were subjected to histopathological examination.

The organ pieces (3-5 micron) were fixed in 10% formalin for 24 hours and washed in running water for 24 hours .Samples were dehydrated in tissue processor and then cleaned in benzene to remove absolute alcohol .Embedding was done by passing the cleared sample through three cups containing molten paraffin at 50 degree c and then a cubical block of paraffin made by the L moulds it was followed by microtome and the slides were stained with haematoxylin–eosin stain .Stained sections of each organ were examined under light microscope at high (40X) power magnification.

Acute oral toxicity

Table 8: Dose finding experiment and its behavioral Signs of Toxicity

No	Dose mg/ kg	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	5	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	50	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	300	+	-	-	+	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-
4	2000	+	-	-	+	+	+	-	+	-	-	-	-	-	-	-	-	+	-	-	-

1.Alertness 2. Aggressiveness 3. Pile erection 4. Grooming 5. Gripping 6. Touch Response 7. Decreased Motor Activity 8. Tremors 9. Convulsions 10. Muscle Spasm 11. Catatonia 12. Muscle relaxant 13. Hypnosis 14. Analgesia 15.Lacrimation 16. Exophthalmos 17. Diarrhoea 18. Writhing 19. Respiration 20. Mortality (+ Present, - Absent)

Table.9. Body wt (g) of Wistar rats in long term toxicity study treated with AVC

DOSE (mg/animal)	DAYS				
	1	7	14	21	28
CONTROL	141.55 ± 3.57	143.60 ± 3.82	149.05 ± 3.54	153.50 ± 4.54	152.15 ± 3.24
X – GROUP	142.33 ± 2.36	149.01 ± 2.66	151.48 ± 3.44	150.60 ± 4.15	151.13 ± 3.11
5X – GROUP	144.47 ± 4.12	149.23 ± 3.44	149.86 ± 4.89	151.77 ± 3.23	152.19 ± 3.53
10 X -GROUP	149.49 ± 3.89	151.22 ± 4.25	150.76 ± 3.09	153.47 ± 5.55	155.13 ± 4.58
P value (p)*	NS	NS	NS	NS	NS

NS- Not Significant, *(p >0.05), n = 6 values are mean ± S.D (One way ANOVA followed by Dunnett's test)

Table.10. Water (ml/day) of Wistar rats in long term toxicity study treated with AVC

DOSE (mg/animal)	DAYS				
	1	7	14	21	28
CONTROL	25.55 ± 2.54	23.60 ± 2.83	33.05 ± 3.59	34.5 ± 4.57	30.15 ± 3.24
X – GROUP	34.33 ± 3.44	31.01 ± 2.66	34.48 ± 4.17	42.6 ± 4.15	37.23 ± 3.44
5X – GROUP	35.47 ± 3.89	38.23 ± 3.36	31.86 ± 3.89	36.77 ± 3.33	38.19 ± 4.53
10 X – GROUP	33.49 ± 4.58	40.22 ± 4.25	36.76 ± 3.09	44.47 ± 5.55	41.13 ± 4.12
P value (p)*	NS	NS	NS	NS	NS

N.S- Not Significant, *(p >0.05), n = 6 values are mean ± S.D (One way ANOVA followed by Dunnett's test)

Table.11. Haematological parameters of Wistar rats in long term toxicity study treated with AVC

Category	Control	X Dose	5X Dose	10X Dose	P value (p)*
Haemoglobin(g/dl)	12.1±0.6	13.4±0.5	13.5±0.7	13.1±0.3	N.S
Total WBC (cells/cu.mm)	4851±450	5677±320	5899±431	5677±329	N.S
Platelets/ul	1368±39.67	1267±70.17	1290±97.57	1298±23.4	N.S
Total RBC	4.2±0.1	5.1±0.2	5.3±0.1	5.2±0.1	N.S
ESR(mm)	1±00	1±00	1±00	1±00	N.S
PCV	48.10±1.88	46.12±2.56	46.44±3.65	47.20±2.11	N.S
MCH pg	18.28±0.45	17.21±0.44	18.66±0.32	18.58±0.42	N.S
MCHC g/dl	30.66±0.98	31.06±0.42	31.17±1.30	30.68±0.55	N.S
Differential count					
Neutrophils(%)	42±8	35±9	24±8	26±9	N.S
lymphocyte (%)	55±10	78±8	76±3	77±8	N.S
Monocyte (%)	2.0±0.48	2.6±0.42	2.39±0.40	2.43±0.30	N.S
Eosinohil(%)	1.10±0.22	1.22±0.30	2.0±0.28	1.78±0.24	N.S
Basophils(%)	0	0	0	0	N.S

N.S- Not Significant, *(p >0.05), n = 6 values are mean ± S.D (One way ANOVA followed by Dunnett's test)

Table.12. Biochemical Parameters of Wistar rats in long term toxicity study treated with AVC

BIOCHEMICAL PARAMETERS	CONTROL	X GROUP	5X GROUP	10X GROUP	P Value (p)*
GLUCOSE (R) (mg/dl)	100 ± 20	112 ±18	116 ± 12	90 ± 25	N.S
T.CHOLOSTEROL(mg/dl)	68 ± 7	70 ±10	67 ± 5	71 ± 4	N.S
HDL(mg/dl)	20 ± 4	23 ± 5	22 ± 5	24 ± 2	N.S
LDL(mg/dl)	22 ± 7	22 ± 8	20 ± 6	22 ± 6	N.S
VLDL(mg/dl)	27 ± 4	25 ± 4	25 ± 6	25 ± 4	N.S
TRIGLY(mg/dl)	133 ± 20	127 ± 17	124 ± 28	129 ±18	N.S

NS- Not Significant,* (p >0.05), n = 6 values are mean ± S.D (One way ANOVA followed by Dunnett's test)

Table.13. Renal function test of Wistar rats in long term toxicity study treated with AVC

PARAMETERS	CONTROL	X - GROUP	5X - GROUP	10X - GROUP	P Value (p)*
UREA (mg/dl)	28 ± 16	26 ± 3	28±7	30 ± 6	N.S
CREATININE(mg/dl)	0.76 ± 0.25	0.69 ± 0.10	0.66 ± 0.09	0.72 ± 0.12	N.S
URIC ACID(mg/dl)	2.51 ± 0.20	2.57 ± 0.36	2.38 ± 0.50	2.43 ± 0.37	N.S
CALCIUM(mg/dl)	8.8 ± 0.8	9.0 ± 0.8	9.5 ± 0.6	10.1 ± 0.6	N.S
POTASSIUM (mg/dl)	2.7 ± 0.4	2.7 ± 1	3.6 ± 0.5	4.1 ± 0.6	N.S

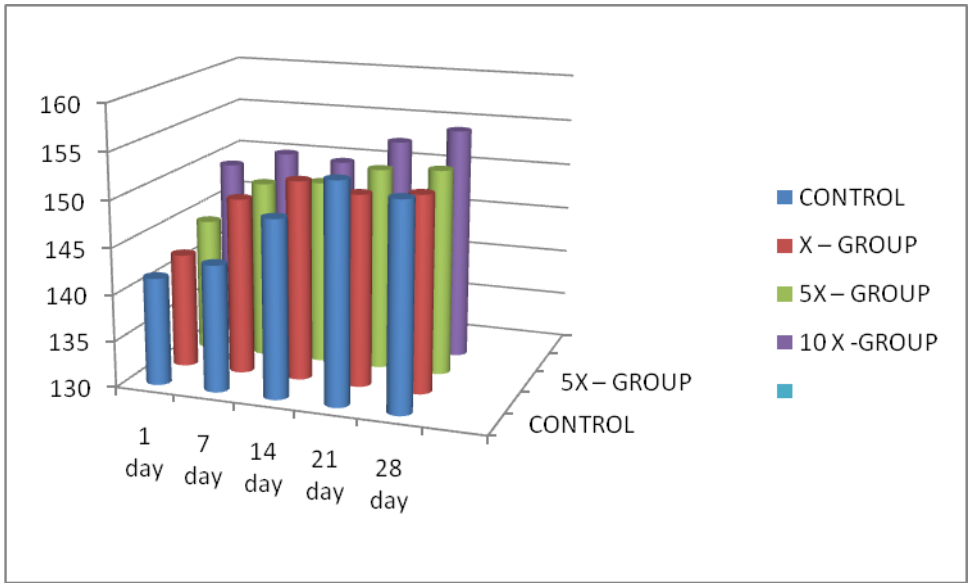
NS- Not Significant,* (p >0.05) , n = 6 values are mean ± S.D (One way ANOVA followed by Dunnett's test)

Table.14. Liver Function Test of Wistar rats in long term toxicity study treated with AVC

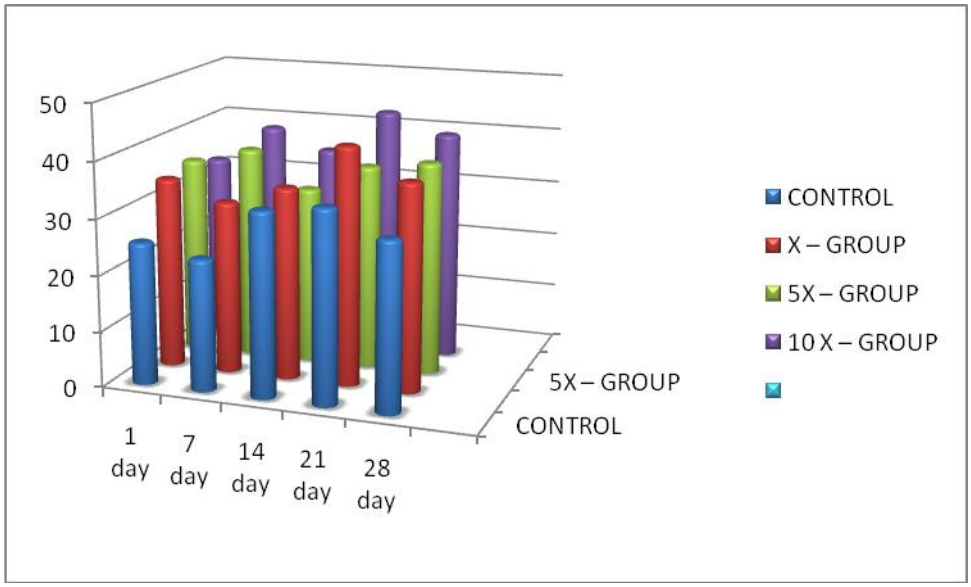
PARAMETERS	CONTROL	X - GROUP	5X - GROUP	10X - GROUP	P Value (p)*
T.BILIRUBIN(mg/dl)	0.9 ± 0.1	0.8 ± 0.1	0.8 ± 0.2	0.9 ± 0.2	N.S
D.BILIRUBIN(mg/dl)	0.3 ± 0.0	0.3 ± 0.1	0.4 ± 0.1	0.4 ± 0.1	N.S
I. BILIRUBIN(mg/dl)	0.6 ± 0.1	0.5 ± 0.1	0.4 ± 0.2	0.5 ± 0.1	N.S
SGOT(U/dl)	67 ± 25	70 ± 23	68 ± 16	63 ± 16	N.S
SGPT(U/dl)	77 ± 31	80 ± 27	86 ± 23	82 ± 22	N.S
ALP(U/dl)	132 ± 6	142 ± 25	140 ± 8	146 ± 20	N.S
T.PROTEIN(mg/dl)	7.0 ± 0.9	6.7 ± 0.3	6.8 ± 0.5	7.1 ± 0.4	N.S
ALBUMIN(mg/dl)	3.3 ± 0.6	3.4 ± 0.4	3.2 ± 0.3	3.3 ± 0.2	N.S
GLOBULIN(mg/dl)	3.7 ± 0.3	3.3 ± 0.2	3.6 ± 0.5	3.7 ± 0.3	N.S

NS- Not Significant,* (p >0.05), n = 6 values are mean ± S.D (One way ANOVA followed by Dunnett's test)

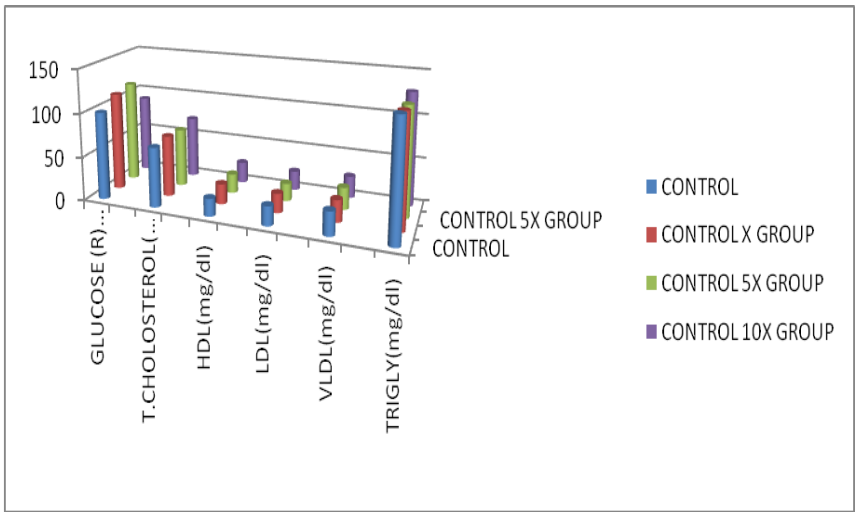
1.Body wt (g) of Wister rats in long term toxicity study treated with AVC



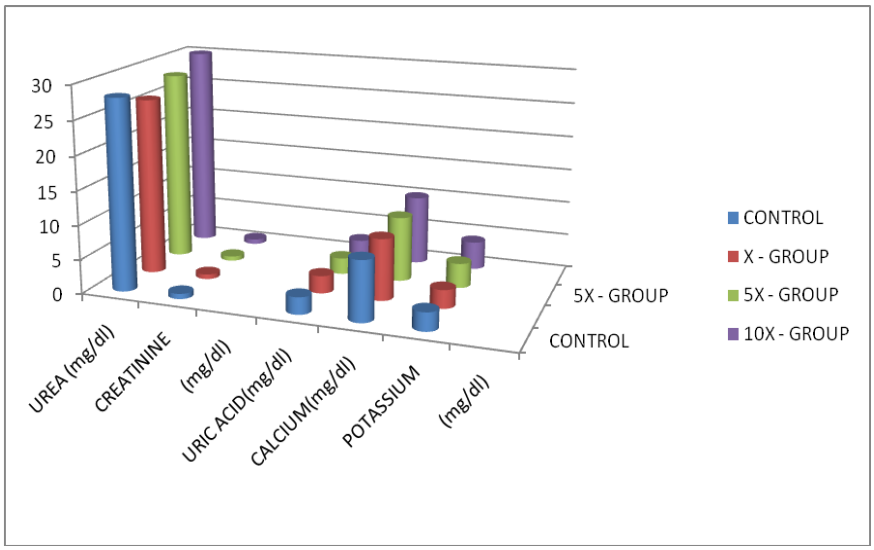
2.Water (ml/day) of Wister rats in long term toxicity study treated with AVC



3.Biochemical Parameters of Wister rats in long term toxicity study treated with AVC

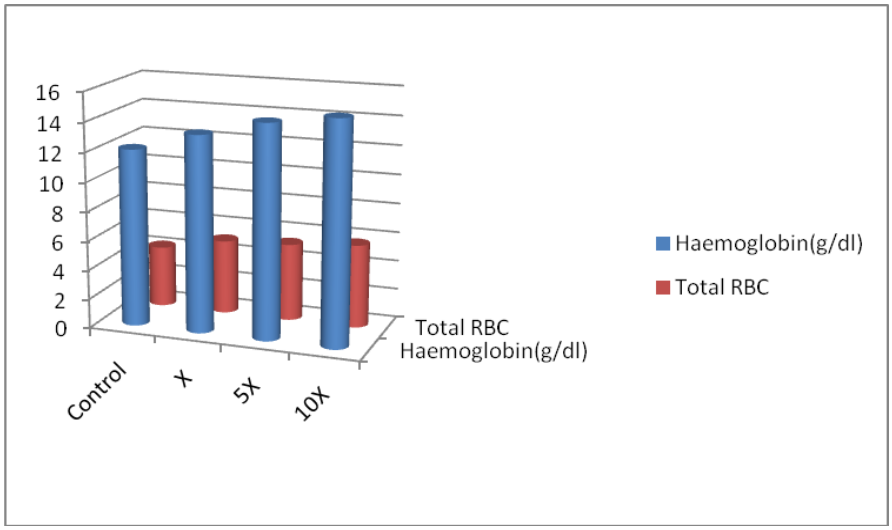


4.Renal function test of Wister rats in long term toxicity study treated with AVC

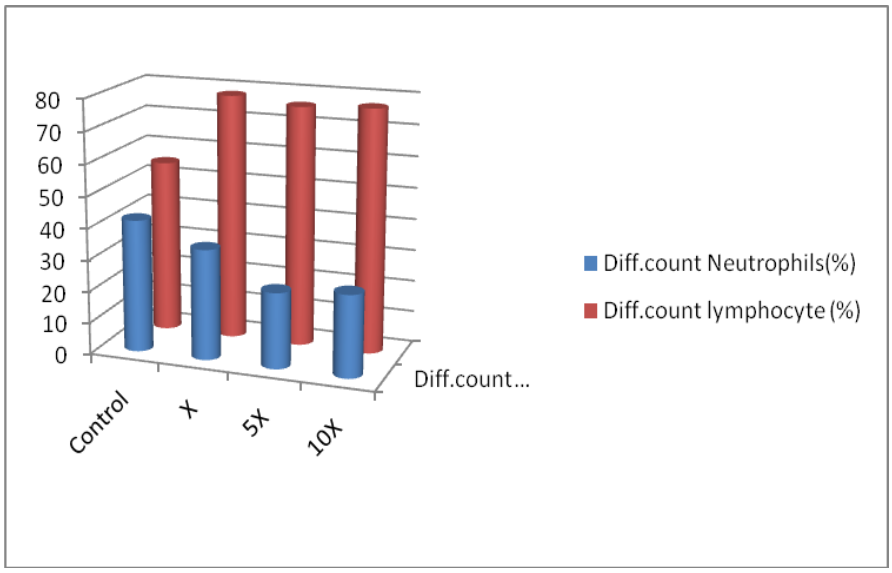


5.Haematological parameters of Wister rats in long term toxicity study treated with AVC

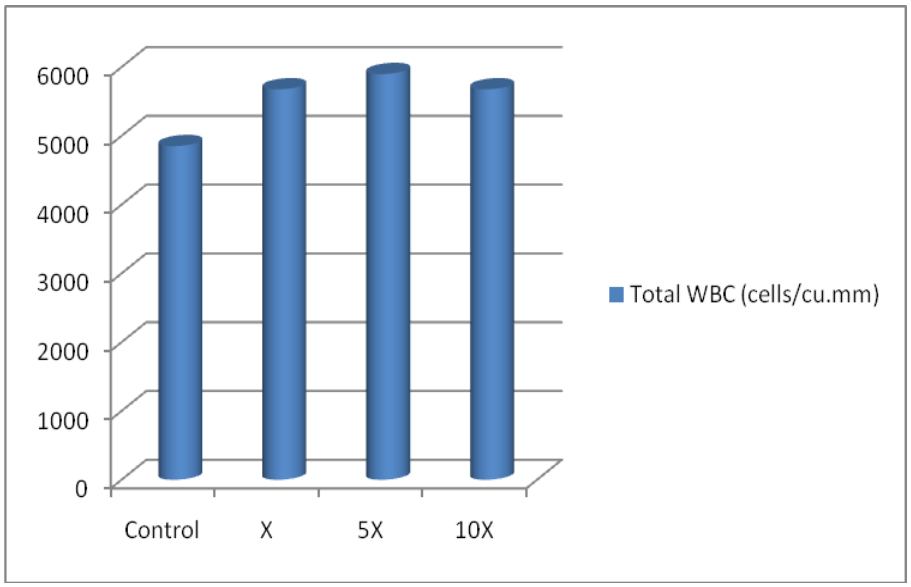
5.1.Mean arithmetic values of Control and test group animals



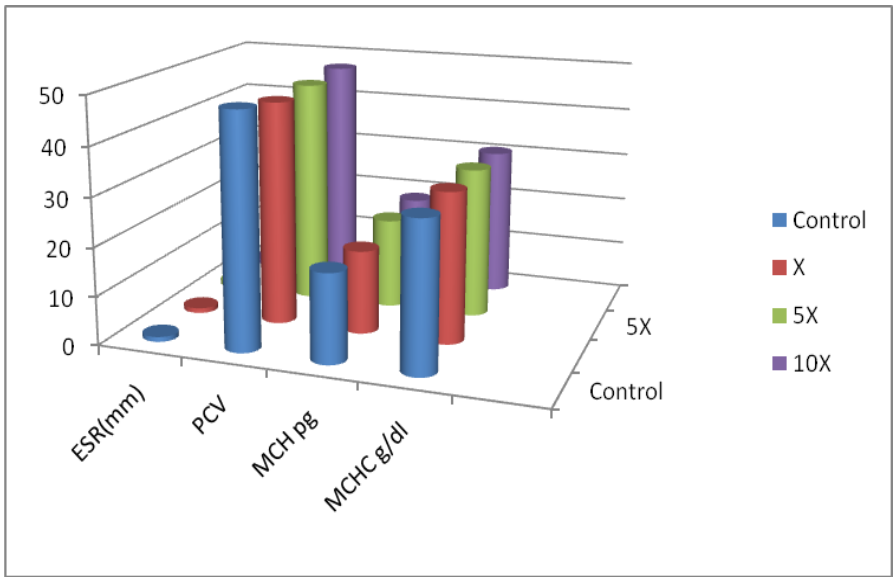
5.2. Mean arithmetic values of Control and test group animals



5.3.Mean arithmetic values of Control and test group animals

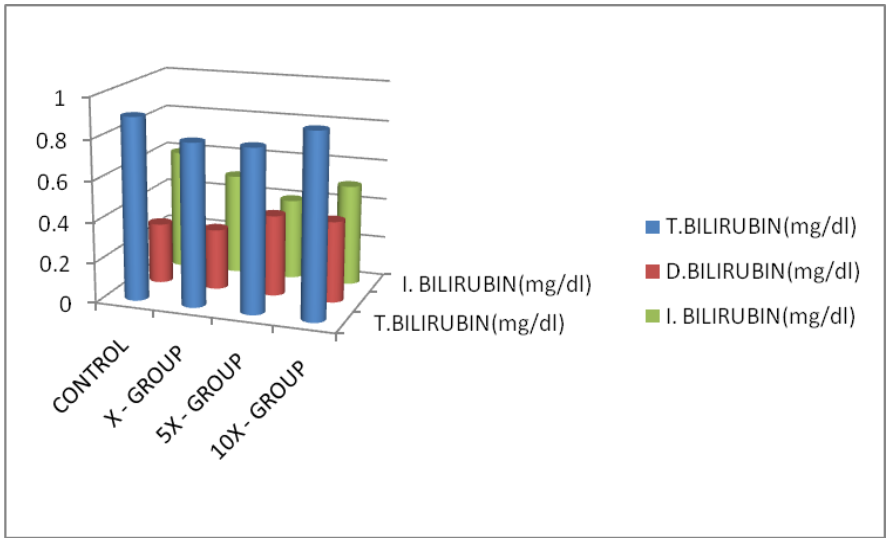


5.4.Mean arithmetic values of Control and test group animals

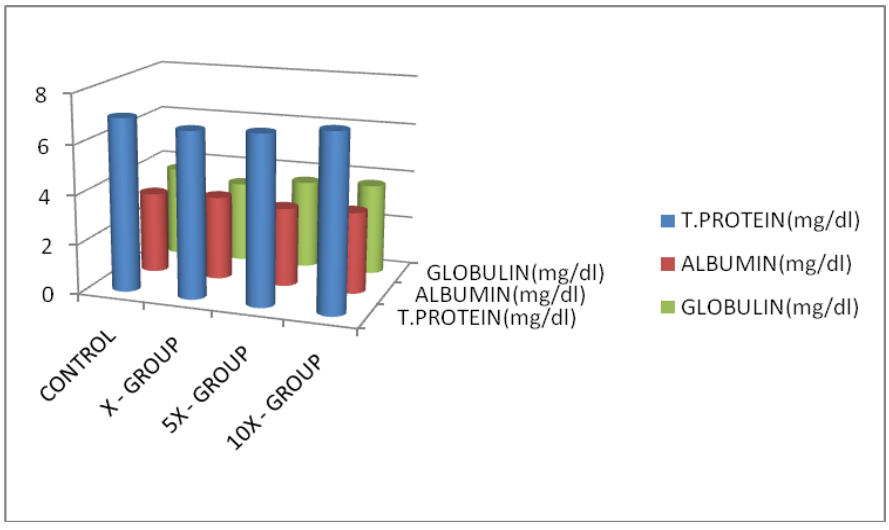


6Liver Function Test of Wister rats in long term toxicity study treated with AVC

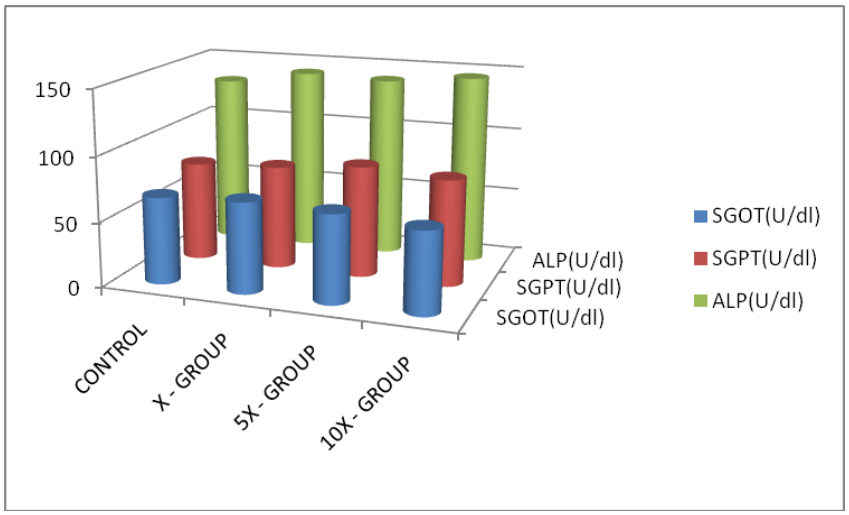
6.1.Mean arithmetic values of Control and test group animals



6.2 Mean arithmetic values of Control and test group animals



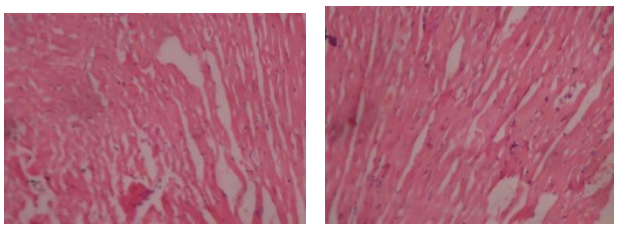
6.3.Mean arithmetic values of Control and test group animals



HISTOPATHOLOGY

1.HISTO PATHOLOGY OF HEART

Control group 1x –A



5x –B 10x - C

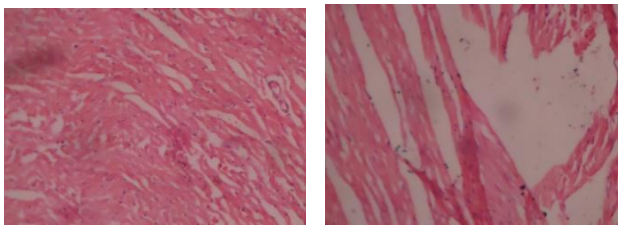
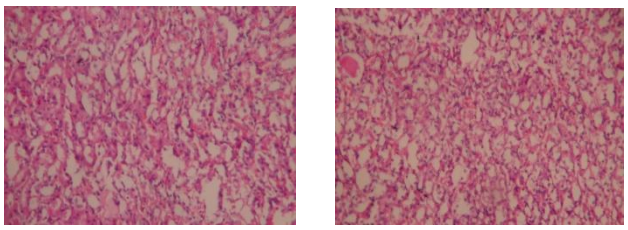


FIGURE.1

2.HISTOPATHOLOGY OF KIDNEY

Control group 1x –A



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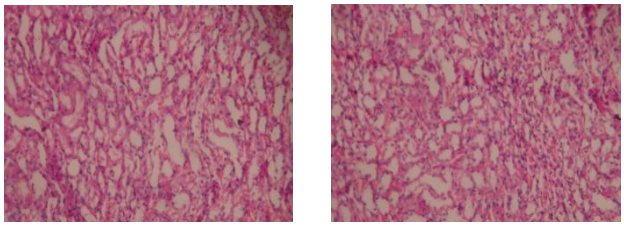
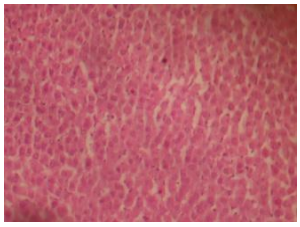


FIGURE.2

3.HISTO PATHOLOGY OF LIVER

Control group 1x –A



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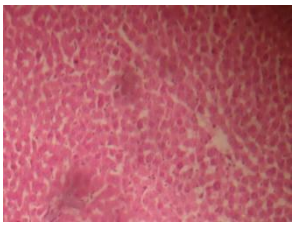


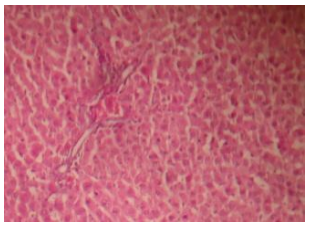
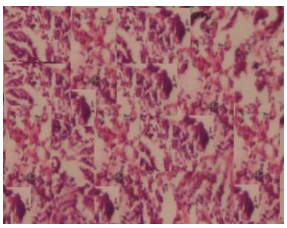
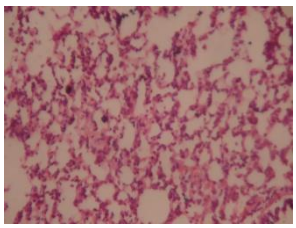


FIGURE.3

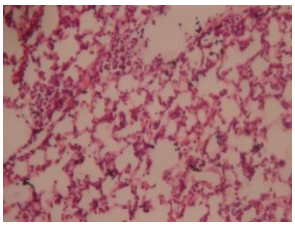
4.HISTO PATHOLOGY OF LUNG

Control group 1x –A





5x –B 10x - C



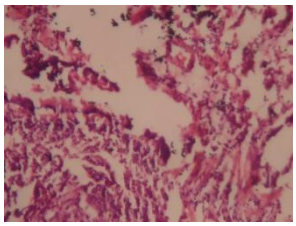
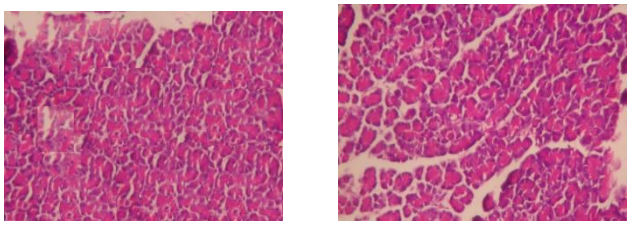


FIGURE.4

5.HISTO PATHOLOGY OF PANCREAS

Control group 1x –A



5x –B 10x - C

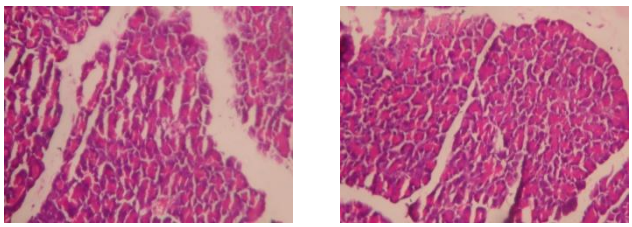
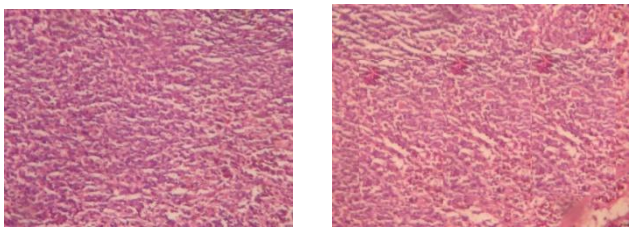


FIGURE.5

6. HISTO PATHOLOGY OF SPLEEN

Control group 1x –A



5x –B 10x - C

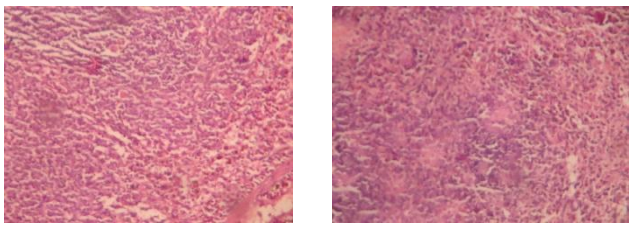
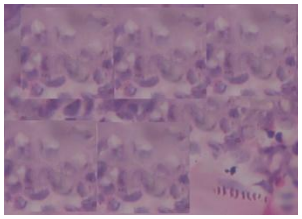


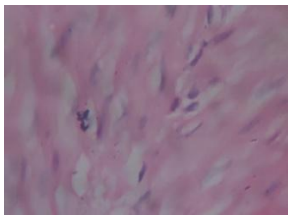
FIGURE.6

7. HISTOPATHOLOGY OF STOMACH

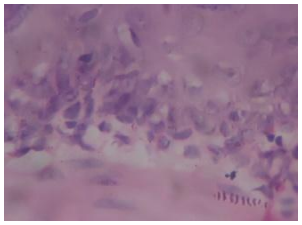
Control group



1x –A



5x –B



10x - C

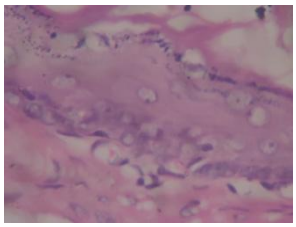


FIGURE.7

9.3g TREATED (low dose) X

Kidney: shows normal renal tissue with glomeruli and tubules.

Spleen: shows normal spleen with lymphoid aggregation.

Liver: shows almost normal hepatocytes and occasional binucleate cells.

Stomach: shows normal mucosal glands

Lung: shows normal alveoli.

Heart: shows normal cardiac muscle bundles.

Pancreas: shows normal acini with islets of β-cells

IMPRESSION: NORMAL STUDY

46.5mg TREATED (Mid dose) 5X

Kidney: shows renal tissue with focal tubular damage, interstitial inflammatory collection. Glomeruli shows epithelial proliferation.

Liver: shows hepatocytes with focal mild fatty change.

Spleen: shows congestion with lymphoid hyperplasia.

Stomach: shows near normal mucosal gland with mild exudates.

Lung: shows congested alveolar wall with mild thickening and mild emphysematous changes.

Pancreas: shows pancreas with acini and normal islets.

Heart: shows congestion and mild inflammatory infiltration in between cardiac muscle bundles.

IMPRESSION: NORMAL STUDY

93.6gTREATED (High dose)10X

Heart: shows hypertrophic cardiac muscle bundles.

Spleen: shows lymphoid hyperplasia.

Liver: shows marked dilatation of sinusoids, degeneration of hepatocytes, necrosis.

Stomach: shows stomach with superficial erosion and congestion

Kidney: shows renal tissue with tubular epithelial damage.

Pancreas: shows normal islet cells.

Lung: shows congestion, narrowed alveolar space and thickened alveolar wall.

IMPRESSION: NORMAL STUDY

Results:

- No weight loss, abnormal animal behaviours, metabolic functions [urination, lacrimation, defaecation etc.,] and mortality were noted.
- In necropsy of the animal organs showed normal appearance and weight.
- All Haematological and biochemical parameters were within normal limits.
- The stastical report of the Haematological and Biochemical datas did not show any significant difference, between the control and test groups.
- In Histopathological studies, No abnormal findings were observed in the organs such as Heart, Liver, Lungs, Kidney and Stomach in X, 5X and 10X compared with control group.

DISSCUSSION

DISCUSSION

In this study **AVC** was subjected to qualitative, quantitative and toxicity studies. Quantitative analysis includes ICP OES, HR SEM, FTIR and XRF. And then finally both acute and 28 days repeated oral toxicity study was carried out in Wistar albino rats as per OECD guidelines.

Qualitative analysis of AVC shows the presence of magnesium, mercury, chloride, phosphate, ferrous iron and tannic acid.

In the **Physico Chemical Analysis** the pH of AVC was 8.3-8.5. It denotes alkalinity. Thus, on oral intake it will not cause any strong alkali or acid like irritation to the gastrointestinal tract. The loss on drying at 105ºc was only 0.86% w/w; hence the drug will not loose much of its volume on exposure to atmospheric air at room temperature. From sieve analysis the size distribution of AVC and the particle retained is 54.74% at 75µ

HR SEM analysis of AVC reveals the particle size as 50-100nm. The particles were homogenously distributed in the chendhuram. And smooth surface of the particles enable its easy for absorption in the gastro intestinal tract. Hence the drug will have increased bioavailability. (Fig.4.)

In **ICP-OES** study, heavy metals like As, Pb, Cd were found below detection limit in unpurified and purified veeram. Mercury, calcium, iron, sodium, phosphorous, potassium levels were decreased in its level from unpurified to purified veeram and same as seen in Ayam.

There was a drastic reduction in the level of mercury in unpurified veeram(124.514) to purified Veeram (95.362). Mercury was detected in the finally prepared medicine AVC as (3.145). The ferrous compound is drastically reduced from 652.441 in unpurified ayam to 523.859 in purified form which further decrease in AVC as 192.9. This indicates that all heavy metals in AVC were within normal range and near to permissible limit. The XRF analysis of AVC all shows heavy metals in normal limits. So that AVC is safe for human consumption

FTIR analysis of AVC shows the presence of functional groups amide groups carboxylic acids,alkynes, aldehydes, primary amines,aliphatic amines. The aromatic compound is seen in purified ayam and lost in the final drug.

In **Acute toxicity study** period there were no abnormal signs developed in albino rats at dosage levels of 5mg, 50mg, 300mg and 2000mg/kg b.wt in 24 hrs. No mortality was observed in the study period.

At the end of **Repeated oral toxicity study** animals were sacrificed by using excessive ether anaesthesia and blood samples were collected then investigated. The organs were collected and sent for histopathology study. All the reports were statistically calculated. There were no significant changes in, biochemical investigations, body weight, food and water intake. There was a marked increase in haemoglobin and TRBC in test groups, but compared to control group, it is not statistically significant.

The **Histopathological study** on the organs such as heart, lungs, kidney, brain and liver was normal in control, X, and 5 X groups. In 10 X group, the kidney shows renal tissue with focal damage, interstitial inflammatory collection. Glomeruli shows epithelial proliferation. Liver shows hepatocyte with mild fatty changes in 5X and marked dilatation of sinusoids, degeneration of hepatocytes, necrosis in 10X. Lung shows congested alveolar wall with mild thickening and mild emphysematous changes. Spleen shows congestion with lymphoid hyperplasia.

SUMMARY

SUMMARY

Siddha system is the ancient traditional system followed in South India mainly in Tamilnadu. It incorporates many herbal, mineral and metal based medicines. veeram is mentioned under minerals and ayam is mentioned under metals. Ayaveera chenduram is one of the notable medicine in the treatment of arthritis, hemeplegia, ulcers and chronic pain associated with other degenerative disease. AVC was taken from the literature **Anuboga Vaithya Navaneetham part I.**

The raw drug veeram and ayam was procured from country drug shop and authenticated at Siddha Central Research Institute. Raw drug was purified and the medicine was prepared as mentioned in the Siddha literature.

Chemical analysis of unpurified and purified veeram sample indicates the presence of mercury, phosphate, iron and magnesium. Analysis of the AVC confirmed the presence of mercury, phosphate, iron, magnesium.

In physico - chemical analysis of AVC the pH was found to be 8.3 - 8.5 and the loss on drying at 105ºC was 0.86% w/w.

After HRSEM analysis, the particle size of the AVC was analyzed as 50-100nm

In ICP-OES study, heavy metals like As, Pb, Cd were found below detection limit in unpurified and purified raw drugs. Mercury, calcium, iron, potassium, phosphorous, sodium levels were decreased in its level from unpurified to purified veeram. In ayam, calcium magnesium, silicon, phosphate and ferrous compound was seen drastically reduced after purification Mercury was detected in minimal level in the finally prepared medicine in AVC as (3.145).

The toxicological evaluations were conducted as per OECD guidelines for safety evaluation of AVC.

In Acute toxicity study there were no abnormal signs developed in wistar albino rats at fixed dose level within 24 hrs. At the end of the study no mortality and reduction in body weight of control and test group animals were observed.

In Long term toxicity study there were no significant changes in behavioural signs, hematological parameters, biochemical investigation, body weight, food and water intake. The lymphocyte count was increased in test groups, but compared with control group it is not statistically significant. The histopathological study on the organs such as heart, lungs, kidney, and liver was normal in X and 5 X groups compared with control group. In 10 X group, the liver shows dilatation of sinusoids, degeneration of hepatocytes and necrosis, lungs shows congestion with emphysematous changes and other showed no abnormal histological variation.

CONCLUSION

CONCLUSION

As the result of this study, it has been concluded that

The decrease in heavy metal content of the prepared medicine when compared to raw drug analyzed by sophisticated instrument reveals the potential background of Siddhars knowledge in the field of metals, minerals in medicine preparation. Mainly the mercurial content of the prepared medicine showed drastic reduction when compared to that of unpurified raw drug (124.514 to 3.145). No mortality was observed in preclinical studies, hence it is safe to humans and in future clinical studies have conducted to evaluate its efficacy.

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ANNEXURE

சித்த மருத்துவ மைய ஆராய்ச்சி நிலையம், அரும்பாக்கம், சென்னை - 600 106
Siddha Central Research Institute
Arignar Anna Govt. Hospital Campus, Arumbakkam, Chennai-600 106
(Central Council for Research in Siddha, Department of AYUSH,
Ministry of Health & Family Welfare, Govt. of India)
Phone: 044-2621 49 25,
Fax: 044 26214809.
E-mail: crsiddha@gmail.com
Web: www.crsiddha.tn.nic.in

08.10.2012

CERTIFICATE

Certified that the minerals submitted for identification by Dr. B. Karthik Kumar, III year M.D., Department of Nanju Noolum Maruthuva Neethi Noolum, National Institute of Siddha, Tambaram Sanatorium, Chennai-47 are identified as Ayam – Iron, Kilinjal – Calcium carbonate, Veerum – Mercuric chloride.

(R.Shakila)
Research Officer (Chemistry)

(S. Jega Jothi Pandian)
Asst. Director- In charge

SOPHISTICATED ANALYTICAL INSTRUMENT FACILITY
INDIAN INSTITUTE OF TECHNOLOGY, MADRAS
Chennai - 600 036. INDIA

CERTIFICATE

Certified that herbo-mineral drug **AYAVEERA CHENDURAM** formulated by **Dr.B.Karthik kumar** III Year M.D(S) Department of Nanjunool ,National Institute of Siddha , Tambaram Sanatorium was analysed (quantitative) by ICP-OES, FT-IR, HR-SEM and Physico chemical Analysis Methods at SAIF, IITM, Chennai-36, during December 2012.

Dr. R. MURUGESAN
Scientific Officer Gr.-I
Sophisticated Analytical Instrument Facility
Indian Institute of Technology, Madras
Chennai-600 036

Phone : 91-44-2257 4935 Fax : 91-44-2257 0545, 2257 0509
e-mail : saif@iitm.ac.in http://www.saif.iitm.ac.in

IAEC PROTOCOL NO: 1248/ac/09/CPCSEA/4-34/2011

20/12/2011

CERTIFICATE

This is certify that the project title. A toxicity study on "AMAVEERA CHENDURAM" **has been approved by the IAEC.**

Name of Chairman/Member Secretary IAEC:	**Name of CPCSEA nominee:**
Dr. K. MANICKAVASAKAM	Dr. B. JAYACHANDRAN DARE
Signature with date	
K. Manickam	
Chairman/Member Secretary of IAEC:	**CPCSEA nominee:**

(Kindly make sure that minutes of the meeting duly signed by all the participants are maintained by Office)

The Tamil Nadu Dr. M.G.R. Medical University

69, Anna Salai, Guindy, Chennai-600 032

This Certificate is awarded to ~~Mr/Ms/Dr~~. KARTHIK KUMAR

for participating as a ~~Resource Person~~ / Delegate in the VIII Workshop

on **"Research Methodology & Biostatistics"**

for AYUSH Post-Graduates & Researchers

organized by the Department of Siddha

The Tamil Nadu Dr. M.G.R. Medical University

from 27th August 2012 to 31st August 2012.

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